PRODUCTION ECONOMICS

JOHN D. BLACK

INTRODUCTION TO PRODUCTION ECONOMICS

By

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PREFACE

This book has been developed during the past two years in connection with the first course in Economics in the School of Business and in the College of Agriculture of the University of Minnesota. Much of the material in it has already been used in two mimeograph editons.

When the School of Business of the University of Minnesota was established a few years ago, it made up its curriculum, as did others of its kind, by taking over the old courses in economics and mixing with them a sprinkling of " applied " courses. A curriculum set up in this way was sure to have a great deal of both overlapping and omission in it, and what is more important, to lack orderly progression from start to finish toward a definitely conceived end. The committees which set to work upon the problem decided to rebuild the curriculum " from the ground up," getting the first two years of work in satisfactory form before proceeding further. A conclusion early reached was that the type of first course in economics which consists of a description of industry is almost certain to be a failure because it has no principles to give body to it. The students may find the reading material interesting enough, but there is nothing for the instructor to talk about afterwards. In actual experience, what they usually do talk about is the principles of economics, dragging them in by the tail and using them to stop the awful hiatuses that arise. The second conclusion reached was that much more emphasis needs to be given to the application of the principles of economics to the problems of production. A school of business by definition must concern itself mostly with production activity. If it is going to apply economics to business, then it must surely stress the economics of production. It is partly because the economics taught in the past has not been related to production problems that so large a part of the actual business of the world is to-day carried on by engineers and others without any training in economics.

My own contribution to the cause was to suggest that the body of economic principles constituting production economics

was the very body of principles which is needed to give coherence and substance to the materials of the usual course in description of industry, and to outline a proposed course exemplifying this, which in due time the curriculum committee approved for trial. It will be apparent even from the table of contents of this book that it contains a great deal of descriptive material, but it also contains a very solid body of principles—some will say, too solid. As given in the School of Business in the University of Minnesota, the course runs through two quarters, five credits or hours per quarter. One of these five hours is devoted to lectures and examinations, and the other four to class-room discussion with twenty to thirty students in a section. This course is followed by a brief course in the mechanism of exchange, which is also a combination of principles and description, but more largely the latter. Following this is a course in value and price and distribution. The author believes that this course should be a ten quarter-credit course, and that considerable descriptive material should be included in it relating to actual markets and price-making processes, to actual movements of prices, wages, rents and interest rates, and to the actual distribution of wealth and income between groups, classes and individuals.

Thus what used to be an "approach" course of ten quarter-credits, plus ten quarter-credits of "principles of economics," has been made over into twenty quarter-credits of principles of economics and descriptive material combined, in which the principles are much more thoroughly presented. The five credits for mechanism of exchange have been taken from another course, formerly a third-year course, called "Financial Organization." Enough material relating to exchange and financial organization is included in this textbook so that further consideration of them can be postponed to the third year.

A book of readings can be used to advantage with this textbook; but it is by no means necessary. An effort has been made throughout to include a cross section of the whole of society, and to develop historical background wherever it is significant. Besides, there will not be a great deal of time left for supplementary reading if the material of this text is properly mastered. Several of the chapters of principles are far from easy. They can be mastered only by taking sufficient time. It is absolutely necessary that the students work out problems for such chapters as XI,

XII, XIII and XXI. Anywhere from five to ten lessons may be needed to master any one of these chapters. They can be taught as well to first-year as to later students; but more time is needed. The difficulties which students have with them arise not from their lack of general information or of understanding of economics in general, but from their inability to comprehend simple mathematical relationships such as expressed by percentages and ratios, "input per unit of output," and "output per unit of input." Such relationships as these exist in economic affairs. Economic activity cannot be understood unless these relationships can be grasped. The time necessary to teach them can be spared even better in the freshman year than later. They are far from being as difficult as some of the relationships taught in first-year college algebra. Somewhat the same methods must be used in teaching them.

It might appear from the foregoing that the presentation in this text is largely mechanistic. An examination of the text, it is hoped, will prove this to be a false alarm. Much emphasis, it is true, is placed upon an understanding of the elementary quantitative relationships of economic science; but this is as it should be in a beginning course. The qualitative and institutional aspects of economic life are properly the materials of study of later courses in economics. Most of the bad economic thinking in the world is due to a failure to comprehend elementary economic relationships, such as expressed in the principle of comparative advantage and the principle of diminishing outputs. No one who really understands the principle of comparative advantage can believe that a protectionist policy is necessary to maintain the American standard of living; but scores if not hundreds of men in this country known to the world as "economists," some of them men who have appeared on programs of the American Economic Association, hold such views. A little cross-questioning will bring out the fact in nearly every case that these men have never really understood the elementary relationships presented in Chapter V of this text. Probably not a third of the students completing courses in principles of economics in this country each year really understand the principle of comparative advantage. Surely until the elementary mathematical relationships embodied in this and the other fundamental principles of economics are properly comprehended, it is no time to be talking about the qualitative aspects of economic

life. But ample space should be given to them later in the curriculum. A considerable part of these phases of economics are introduced in an elementary way in Part Five of this text, called "The Coördination of Production," in which the dynamic factors in economic life are unusually emphasized.

The other principal characteristic of this textbook is its effort to show the relation between economic science and natural science, and the manner in which the two become jointly applied in the handling of any so-called economic problem. This is another direction which teaching and research in economics must take if those who espouse it expect to be appreciated properly out in the cold world.

While the approach to the subject in this textbook is primarily from the standpoint of the individual entrepreneur, the finish is from the social and national standpoint. This seems to be the proper attack on the problem both logically and pedagogically. One great merit of it is that it brings out the similarities and the conflicts in the two points of view.

The most difficult problem connected with the development of the subject matter of this textbook is the presenting of the principles involved to students who, it is assumed, have not been taught the principles of value and price. I was told by many at the outset that it could not be done. The conclusion I have reached is not only that it can be done, but that it helps to an understanding of these principles to teach them in this way first and then relate them to the principles of value and price subsequently; and furthermore, that the principles of value and price can be much more effectively presented after the foundation has been carefully laid in a course based upon such a textbook as this. If either is to be presented first without the other, it should be the production economics.

But it must not be understood that the subject of production economics has been completely covered in these chapters. In particular, various aspects of it growing out of the interaction of value and price and production organization need to be presented later. This can be done as part of the course in value and distribution; or it can be handled in a single advanced course in production economics; or it can be taken up in its proper place in each of the advanced courses in an economics curriculum.

Anyone wishing to make use of this textbook following a course in principles of economics will find little difficulty in doing so.

No doubt some of the descriptive chapters will want to be omitted; and it will be desirable for the instructor to tie up the principles here presented with the principles of value and price. It is expected that some teachers of economics will feel that the material here presented is better suited to sophomores or juniors than to freshmen.

This particular textbook should not be looked upon as the final form which a course in economics conceived as above indicated will take; nor as exactly suited to the needs of any college or department of economics which may accept the general idea which is embodied in it. Undoubtedly much revision will be found advisable. It is in order to secure the assistance of a larger group in this revision that I am haltingly presenting it to the general public at this time.

J. D. B.

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CONTENTS

PART ONE

THE FIELD OF PRODUCTION ECONOMICS

PART TWO

SPECIALIZATION AND COMPARATIVE ADVANTAGE

Part Three

The Elements of Production and Their Combination

PART I

THE FIELD OF PRODUCTION ECONOMICS

CHAPTER I

THE FIELD OF ECONOMICS

The purpose of this textbook is to introduce the student to the subject of economics, and to do this by taking up with him that division of the field which for pedagogical if not for logical reasons should come first, namely, the division of *production economics*. Most introductory textbooks undertake to outline the whole field and to give the student a little general knowledge concerning all parts of it. This textbook does not follow such a plan. Instead, it takes up one major division of the subject, and tries to present the various phases of this in sufficient detail to serve as a foundation for advanced courses in the several fields of economics. Even this textbook, however, comes far from exhausting the subject of production economics. Students with special interests in the field will want to follow this course with advanced courses of various descriptions.

Before we can understand what production economics is, we must know something about economics itself and its relation to the rest of the field of human knowledge. Usually the best time to define a subject is at the end of the book. Only by that time can most readers be expected to know enough about it to be able to talk about its definition intelligently. But, on the other hand, some sort of a notion of the subject which is going to be discussed is needed at the start in order to keep the discussion within bounds in the following chapters. We shall therefore attempt a brief explanation at this point.

The words in the English language which are most like economics are *economical* and *economize*. To economize is to get along with a little of something, to make a given amount of it go a long way. An economical person is one who economizes. Now these are exactly the meanings which are needed for a definition of economics. Economics is the science and art of economizing, of making things go a long way.

For various reasons, however, this is hardly a complete or satisfactory definition, and therefore do not let it fix itself too firmly in your mind till we have time to amplify it a little. In the first place, it does

not tell us *what is economized.* We shall presently discover that in the last analysis it is always human effort in one form or another that is economized. We economize in the use of land, it is true; but this is merely to make labor go as far as possible. A little labor may be used on a large tract of land, or a large amount of labor on a little land. If we are wasteful in the use of land, we must use more labor. Labor and land are therefore in a sense substitutes for each other. We also economize in the use of machinery and buildings and supplies; but these are in large part simply stored-up labor. Being wasteful in the use of a building is being wasteful of all the labor that went into the erecting of it and into the sawing of the lumber for it, the felling of the trees, the hauling of the logs, and the mining and smelting of the iron that went into its doors and hinges, as well as of the land that went into the trees and iron. When we economize natural resources, and the various forms of commodities derived from man and nature together, we are in the last analysis only economizing the human effort which they represent in one way or another. Probably, however, our definition will be more understandable to everybody if we speak of economics as economizing both human and natural resources. It will not occur to most people until they think about it that economizing human resources also includes natural resources.

It is one of the cardinal requirements of a good definition that no form of the term defined shall be used in the definition of it. It is hardly proper, therefore, to use the term *economizing* in defining economics. An expression which carries nearly the same idea, and perhaps fits the modern concept of economics even better than economizing, is *utilizing to best advantage.* We may therefore restate our definition of economics by saying that it has to do with the *utilizing of human and natural resources to best advantage.*

This economizing or utilizing to best advantage of our resources is the biggest thing that is going on in the world. It includes, in fact, nearly everything that is going on in the world. The miller when he plans his mill and operates it so as to grind flour at the lowest possible cost, is trying to utilize his resources to best advantage. So is the merchant when he selects a stock of goods for resale to his customers. So is the housewife when she selects food and clothing for the family. So are you when you decide to spend some of your money for theater tickets in place of a pair of shoes. Likewise Congress was trying to utilize resources to best advantage when it passed the resolution starting the prohibition amendment on its way. So is an author when

he polishes his style. Herbert Spencer said that the first principle of a good style of writing was *economy*—economy of the reader's attention.

It should be obvious, however, that not everything involved in the economizing or utilizing of our resources is properly included in *economics*. The miller in his production processes has many things to think about which are not *economics* at all. For example, he has the task of selecting wheat which will make a certain kind of flour with certain baking properties; he has to remove all impurities from it, clean it and scour it, and finally grind it in such a way as to take exactly that part of the kernel which is needed for the type of flour he is producing. Before these things could be accomplished, machines of many kinds had to be invented and plants had to be designed and built. Some of these tasks have important economic implications, but for the most part they are purely matters of *engineering*. If we were to take a shoe factory for an example, we would find very similar problems; or a cold storage plant, or a railroad, or a department store, or a household. Even in the selecting of goods for consumption, one must know the properties of the goods between which one is choosing—such properties as the food values of different foods, and the wearing qualities of different cloths and leathers.

It is apparent, therefore, that some aspects of the utilization of resources are not economics. What is the principle that distinguishes between those which are economics and those which are not? It can be stated in a few words: in general those which are based directly on natural science considerations, on the *physics and chemistry* of things, are not economics. They are usually designated as *engineering;* or on the farm, as *husbandry*. There is no good word in common use which designates such problems of the household; but if one were developed, it probably would be *householdry*.

But what does this leave for economics? Let us discover this by listing a few of the considerations which are outside of the realm of chemistry and physics. The miller, for example, in planning his building must take account of the relative prices of different materials, of the prices which he must pay for labor and different grades of labor, and of the relative costs of machines and labor; and when he starts operating his mill, he must consider the price of different grades of wheat, and the price at which he can sell the quality of flour which he can make from different grades of wheat. The husbandman must consider the rent he has to pay for his land, the wages of his labor, the

prices of his supplies and equipment. The housewife must consider the relative prices of different kinds of dress goods, or foods, or pieces of furniture. Thus at every turn, the miller, the husbandman, and the housewife—and for that matter, the merchant, the tailor, and the statesman—are confronted by considerations of *price* and *value* in the form of costs of materials, or wages, or rents, or interest rates, or selling prices of products. In the utilization of resources, therefore, besides the many considerations based on physics and chemistry and the other natural sciences, are as many more involving *value* and *price*. *The latter are the subject matter of economics.* We can now carry our definition of economics a step further and say that it is the science and art of the utilizing of human and natural resources to best advantage, *in so far as considerations of value or price are involved.*

We should now be able to see more clearly the relation between economics and physics and chemistry. Physics and chemistry have to do with certain material properties of things, such as their form, weight, strength, hardness, durability, taste, color and wearing qualities. We commonly speak of these as *physical* properties; but, as a matter of fact, they can be explained in chemical terms as well as physical. Chemistry merely provides us with another way of describing them, that is, in terms especially of their composition. It tells us, for example, that water is composed of hydrogen and oxygen atoms combined in the ratio of two to one. Pure salt is composed of sodium and chlorine atoms combined in equal proportions. Differences in form, weight, strength, hardness and the like are all associated with differences of this sort in chemical composition. Such properties as these, whether explained in physical or chemical terms are ordinarily referred to as *natural* properties, and the sciences which explain them as the *natural* sciences. This does not mean that all such properties of materials are of natural origin, like the properties of coal or granite or air; but merely that they are explained in terms of natural forces and natural processes. Thus Portland cement, an entirely artificial product, owes its qualities and its uses to certain inherent natural properties in the materials which are mixed in its manufacture.

The science of economics, it will be apparent from the foregoing discussion, has to do with the *value properties* of things, as distinguished from the physical and chemical properties. The various ingredients which are put together by the paint manufacturer have their value properties as well as their physical properties. They may make an expensive or a cheap paint, as well as a durable fast-color paint or

one that cracks and peels or fades in the sunlight. An automobile manufacturer may use cheap or expensive grades and types of steel and leather, as well as steel of low or high resilience and leather of poor or good wearing qualities.

The other important *natural* sciences are mathematics, botany, zoölogy, astronomy and geology. The remaining natural sciences, such as climatology, meteorology (the science of weather), crystallography, soils, and the like, are mostly subdivisions of these larger classifications. Botany and zoölogy are frequently grouped together and called biology (the science of life). Anatomy, physiology and the like are subdivisions of biology. The group of sciences to which economics belongs are known as the *social sciences*, the sciences relating to man as a member of society. Economics is a social science because the value properties of things are social, or at least human, in their origin; that is, they grow out of the relationships of men to them, and mostly out of the relationships of men to each other. The question is frequently raised as to whether one person living alone upon an island isolated from the rest of the world, like Robinson Crusoe, would have any value considerations. It seems very clear that such a person would consider the relative values of everything associated with him. Robinson Crusoe undoubtedly weighed very carefully the value of his precious store of ammunition against the value of the animals he could kill with it. He considered, although probably not very carefully, the worth to him of the different foods he could secure, and of the different uses he could make of his time and effort. Value therefore does inhere in the relationship of men to things; but as we shall see later, it also inheres in a very important way in the relationship of men to each other. Values in the economic sense are therefore human and social in the origin. This makes economics a human and a social science.

The criterion for determining whether a given social consideration is economics or some other social science is whether or not it relates to value or price. If it is primarily a matter of value and price, it is economics; if not, it is political science, sociology, or some other social science. If it relates primarily to government in any way, it is *political science*. *Sociology* is the newest of the important social sciences. Such being the case, its province is not clearly recognized as yet. It is commonly defined as the science of society. It seeks, on the theoretical side, to lay down general principles for all forms of social activity, economic, political, educational, religious, charitable, recreational,

etc. Practically speaking, it concerns itself mostly with non-economic and non-political types of activity.

But although it is usually possible to determine whether a given consideration involves value or price, it is frequently not possible to say that a given problem is wholly an economic problem, or, for that matter, wholly an engineering problem, or a political science problem, or a sociological problem. The practical problem of mixing paint has been shown to be a combination of economic and natural science considerations. Likewise is the problem of making automobiles. The political science problem of raising revenues to maintain the government has important value and price aspects; likewise the problem of managing a public school system, or financing a church, or administering poor relief. Most practical problems therefore draw upon more than one of the sciences; and nearly all of them, it will be seen, in some way or other draw more or less upon economics.

Historical Development of Economics.—The history of the development of economics helps us to understand its relationship to the other sciences. The word "economics" is of Greek origin, and signified for the Greeks the administration of the household. The Greek household, however, was usually a farm household, and the administration of the farm and household was considered as a unit. In this connection, it must be remembered that in ancient Greece the sciences of mathematics, physics, chemistry, biology and geology and psychology had not been differentiated; in fact, whatever was known or supposed about them was mostly included along with what to-day we call philosophy. Economics as the Greeks conceived it therefore included such things as the cultivation of crops, the care of live stock, the planning of the house, and even the preparation of food for the table.

By the usual processes of language-making, however, the Greek word economics, transmitted along with the rest of Greek culture first to Rome and then to the rest of Europe, came to be much more broadly used. Its first important new use was in the term "political economy," which meant the administration of the affairs of the state, the state being looked upon as a large household. As then conceived, political economy included such things as the operation of canals and highways and the management of public lands, forests and mines, as well as the collection of revenues, the preservation of the peace, the public defense and the like. These were affairs of the state household,

comparable to the cultivating of crops by the Greek household. This definition of political economy held for several centuries. It was changed by the development of our natural sciences, particularly as these were followed in the last hundred years by the applied natural sciences of engineering, husbandry, householdry and the like. Although the state still concerned itself with these same problems of operation and management, it began to call upon engineers to handle their "technical" details. If it had problems of forestry to handle, it called upon specialists trained in the technic of forest management. Presently government itself began to be looked upon as an art with a scientific foundation. This was really the first of the social sciences to develop. The philosophy of the Greeks had always given major emphasis to problems of administration of public affairs. Plato's *Republic* was a great masterpiece of early thinking upon this subject. Modern legal systems have their beginning in Roman law. The courts of to-day trace some of their decisions back in an unbroken line of precedents to the interpretations of great Roman jurists. To-day we have our laws made by men especially selected for this purpose, administered in part at least by men especially trained or experienced in public administration, and interpreted for the most part by one of the most highly trained body of professional men in existence. Another great field of specialization to develop was education, with its fundamental science, psychology. Lastly came sociology, on the scientific side as a sort of synthesizing, all-pervading science of society; and upon its applied side as the administration of various sorts of reform and charitable institutions.

Hence all these various modern sciences, first the natural sciences and the applied science based upon them, and then the social sciences and the applied science based upon them, can be conceived as having been taken out of the sphere of economics as the Greeks knew it. In a sense, ancient Greek philosophy can be said to have mothered them all. What are left for economics, as already explained, are only those phases of administration which involve considerations of value or price. Building or operating a canal is no longer economics, but engineering—although the engineer who handles the job may have some economic problems in connection with it. Educating the young is no longer economics, but psychology and pedagogy instead—although some economic considerations may become involved in it. The administrators of public affairs look primarily to jurisprudence and political science for guidance in their tasks—although here the

value and price aspects of things are especially likely to become important.

Meanwhile, in the world itself, certain changes were going on which made economics, in the sense in which we now understand it, of increasing importance. We have already stated that although Robinson Crusoe had his economic problems, they were, relatively speaking, very simple. The economic problems of the self-sufficing community units of medieval Europe were likewise relatively simple. In fact, it is only in the past two hundred years that economics as a science has risen to preëminence in world affairs. The first great treatise on economics, Adam Smith's *Wealth of Nations*, was published in 1776. The development which has brought economics into the foreground is the increasing amount of exchange. Robinson Crusoe exchanged nothing; he produced for himself everything which he consumed. The members of a medieval community produced mostly for exchange among themselves. In modern society, a large proportion of production is of goods or services intended for exchange in one form or another; in other words, a large part of production to-day is for the market. To facilitate this exchange, standardized "media of exchange," or "moneys" have been developed. This means that goods and services are to-day mostly exchanged for money, which is in turn exchanged for other goods and services. This development of trade and commerce and systems of exchange has given new and great importance to the phenomenon of *value*. Things had value on Crusoe's island just the same as if the island had been densely populated, although of course not the same values. But value would have been of vastly more significance to him if he had carried on some form of trade with a neighboring island. He would then have weighed the worth to him of certain supplies which he could obtain only from the neighboring island, against the worth to him of certain things which he could produce on his island in surplus of his needs. With every step toward more exchange, value has become more significant. The introduction of money made it possible to express values in terms of a common measure or standard. Values so expressed are called prices. There is scarcely a good or service of worth to human kind which is not found to-day with its value expressed as a price. Commerce has brought the different moneys of the world into such relation with each other that it is possible at nearly all times to translate any one into terms of all the others. For many of the staple commodities, the price in any one country is closely related to the price in other countries.

As a result of these developments, practically all human activity, production, consumption, government, education, etc., has become related to, almost dependent upon, considerations of value and price. Economics itself has almost become an all-pervading science.

As one would expect, the term has changed its meaning somewhat while these changes have been going on in the economic world. For a long period, about the only scientific use to which it was put was in the term political economy. The only science of economics which we had was that which pertained to the affairs of the state. Many university departments are still called departments of political economy. Recently, however, in the last fifty years especially, the term economics has come to be used more and more in relation to the administration of almost any kind of an institution or enterprise. Thus we speak of railway economics, factory economics, farm economics, household economics, etc. Political economy, or state economics, is therefore only one of the many fields of economics. The term "Economics" itself has come to apply to a general body of scientific principles which underlie all the fields of economics. This use of the term is comparatively new. In fact, it is doubtful if it can even now be said to be generally accepted.

Pure *vs.* Applied Economics.—Like other sciences, economics has its pure and its applied aspects. The pure science of economics attempts to account for economic phenomena, just as physics and chemistry try to account for natural phenomena. A great storm center sweeps across the continent traveling southeastwardly at first and then northeastwardly, accompanied by a falling barometer, rising temperatures, heavy rainfall, and a succession of wind changes. Why do such storm centers develop? Why do they usually develop in the Northwest? Why do they characteristically follow a certain course? Why do the atmospheric pressure and the temperature and winds behave as they do while the storm is passing? These are all questions which natural science tries to answer, and in answering which, sets up a body of principles or statements of causes and effects. Similarly, at irregular intervals, usually between 7 and 10 years, business depressions descend upon us, manifesting themselves first in the centers of industry and trade, but presently permeating to the remotest villages, accompanied by falling prices, unemployment, reduced volume of trade, "frozen credits," business failures, etc. Economic science tries to explain this phenomenon, and in doing so, sets up a body of principles or statements of causes and effects.

The foregoing is only one of an immense number of economic phenomena that must be explained. Untold numbers of changes are taking place this very day for which economic science should have an explanation. For example, some prices are rising, some are falling; the consumption of some commodities is increasing, of others, decreasing; and similarly for production. Why do different types of business units vary in size? And why are there wide variations within each type? Why do costs of production vary between different sections of the country? And between different factories in the same district?

The body of principles, so far as discovered, which explains the foregoing and similar economic phenomena in terms of cause and effect, is the *pure science of economics.*

The applied economic sciences attempt to make use of these principles in administering economic enterprises, in directing economic activity. To know why storm centers behave as they do is of no immediate value to us unless it will provide us with a way of controlling them or preparing for their coming. To explain the phenomena of business cycles is of no immediate value to us unless it helps us to cope with them to better advantage. There will always be those who will study economics as a pure science, who will be content merely to explain the causes of things, and give no heed as to whether or not their findings ever prove of any value to humanity. Such men render a very high service. It has been demonstrated many times that by such workers are most of our great discoveries made. But without workers of another sort, the applied scientists, to follow up their discoveries and apply them and demonstrate their value, their work would all go for naught. And so we must have the pure scientist who will explain to us why prices rise and fall, and the applied scientist who will make use of his results in forecasting prices, or perhaps even in controlling them. And the man who explains variations in costs must be followed by another who will show us how to reduce costs.

Those who should concern themselves with the application of the principles of economics are the students of business administration, factory administration, farm management, home management and the like. Unfortunately, however, the majority of those who are students in these fields have relatively little understanding of the principles of economics. The body of subject matter and rules of procedure which they have gathered is derived mostly either from the natural sciences or from an observation of economic activity and the

ways of the business that is unenlightened by the fundamental laws of economics.

The principal reason for this state of affairs is that economics is a new science and business practice is very old. Captains of industry and commerce have had to act and determine methods of procedure whether any scientific basis was available for them or not. A parallel case is that of medicine. There have been healers of various kinds since the beginnings of the race; but only within the last two hundred years has medical practice had any scientific basis. The nature of the circulatory system was discovered only in 1628; and Pasteur's germ theory was announced only in 1866. All these years, practice has gone ahead of science. It is still ahead of science, although constantly less so. And where science does not explain, tradition rules, and narrowly circumscribed individual experience. So it is in the field of business, except that science is further in the rear of practice, and tradition still more in control, and especially individual experience.

Even when science has furnished a sound basis for practice, it takes decades, perhaps centuries, for men to accept it. Economic science is so new that it is not generally a part of the common body of understanding, and what few economic principles are part of the stock in trade of ordinary men of affairs, are very imperfectly understood by them.

Economics and Business.—Economics is sometimes called the "science of business." This represents too narrow a use of the term economics; but it does bring out the importance of the relation between economics and business. Perhaps the most important part of business is buying and selling. Some businesses buy merely for the sake of selling again—this is true of all the merchandising types of business, the retail stores, the wholesalers, the jobbers, and even the bankers. Commission merchants, auction companies, and brokers merely sell or buy for somebody else. Or it may be said that they sell their own services. Others buy, manufacture, and then sell. A railroad company buys equipment, fuel and labor and sells transportation service. Thus all businesses either buy or sell, and most of them do both; and this is a major part of their activities.

All buying and selling is in terms of price. One cannot buy or sell to-day except in terms of price. All businesses which both buy and sell, and this includes most of them, are greatly interested in the relation between the buying prices and the selling prices, the buying prices

of their stock of goods, raw materials, supplies, labor, land, loans and the like, and the selling price of their product. The difference between these two largely determines their prosperity. There are some business men who will say that all that the business man is interested in, or needs to know, is what prices he will actually have to pay when he buys, and take when he sells, and that he is not concerned with the question as to why these prices are as they are. But such business men are greatly in the minority these days. Most of them want to know all they can about the reasons for prices and price changes; and they are scolding the economists rather freely because they do not give them a better explanation of such things.

The first reason that business men need to understand prices as well as to know them is that some time usually elapses between the time when they buy their stock of goods, or their raw materials, supplies and labor, and the time when they sell; and prices of all are constantly changing. Several months elapse between the time when butter is put in storage in June and July and when it is sold the following winter. In the summer of 1924, much butter was bought for storage at a price as high or almost as high as it was sold for during the winter. Obviously the dealers in butter would like to know why butter prices behaved as they did during this year, and all preceding years, and out of this construct as much of an explanation as possible as to how butter prices generally behave and the reasons therefor. The manufacturer of leather is in an even worse predicament; it may be over a year after he buys his hides before he has a product ready to sell. The sudden break in prices in 1920 bankrupted all but a few of the important tanning companies in the United States. The business man therefore wants to understand prices so that he can anticipate future price changes as far as possible.

Prices also vary in different markets. The man who has a product to sell, or raw materials to buy, wants to know first of all what prices are prevailing in the different markets so that he can choose the most favorable market at any given time. But to do this intelligently, he needs also to know why prices are different in the different markets, since they are never fixed in any market, and may change either up or down long before he can arrange a sale or purchase or reach a market with his goods.

Prices also vary as between different grades of goods. The physical properties of goods are one thing; the value properties are another. Cloth that weighs two ounces more to the yard than a given grade

may sell for fifty cents more per yard; or for a dollar more. What determines the amount of this difference? How much is this extra two ounces worth to a particular clothing manufacturer? Will he be able to sell the overcoats made from it for enough more to pay for the extra price? At any particular time the difference in price between two grades of wool or wheat may be more or less than at another time. The amount of this difference will determine what grade, or what amount of each grade, can be used to most advantage. Problems of this sort are arising all of the time in the business world. If a business man is to act intelligently, he needs to know the relation between prices and grades of quality, and the reasons for this relation, and for variations in it.

Another phase of business which requires an understanding of economics is its organization. Not only is a business man interested in the prices of what he buys and sells, but also in organizing his business in such a way that he can turn out his product at the lowest possible cost, price of product being assumed. His costs will vary according to his volume of business, the relation between his volume of business and the size of his plant, the types of equipment and supplies used, the amount and kind of labor and management employed, and a score of other things. These are all problems of utilization involving considerations of value and price.

Business and the Applied Natural Sciences.—Although business involves at every turn the fundamental principles of economics, one must not get the impression that it involves only economics. The shoe manufacturer cannot expect to succeed unless he knows leather and shoe mechanics as well as the economics of prices and of organization. The successful wholesale grocer must know the differences between the different grades and types and brands of coffee, tea, flour, soap, prunes and apples, as well as the differences in prices. A building contractor needs to know a hundred things about building materials, such as the strengths of different sizes and types of beams, the durability of different woods and of different types of wood finishes, and the insulating value of different types of linings. He should know how much an additional inch in the width of an I-beam will add to its strength as well as how much it will add to its cost. Most actual businesses thus represent a very close intermixture of economic and natural science considerations. They cannot be operated successfully either by a man who knows only economics, or by a man who knows only engineering. Thus far, they have been operated mostly by men

who have learned all of both the economics and the engineering which they know by growing up with or in the business; or by men who have been trained either in engineering or economics, and have learned the other on the job. The principal objection to the latter arrangement is that men trained in one of these phases of business are prone to underestimate the importance of the other. The engineering type of business manager is likely to consider price variations as of far less significance than they are, and presently find himself loaded with a large stock of raw materials purchased at a high price, after the bottom has dropped out of the market. The man without engineering training is likely not to analyze closely enough the properties of the goods he is handling, or of the raw materials he is using.

Economics in the past has too generally neglected the engineering or technical side of business. It has been content to furnish a generalized explanation and let the practical business man make such use of it as he will. Unfortunately the practical business man makes very little use of it under such circumstances. Instead he condemns all economics as valueless and as having no practical relation to his problems. The economist of the future, if his work is to be respected outside of his own ranks, must carefully relate his economic principles to engineering and other technical considerations. It seems to be too much to expect that the men now managing our business enterprises, or the men whom we are now training either as engineers or as economists, will make the necessary tie-up of economic and natural science principles.

Hence, although when looked at as sciences, economics and physics and chemistry are as far apart as sciences can be, when looked at in their relation to the concrete problems of our existence, they supplement and complement each other at every turn. If our universities are to meet the needs of society, they must recognize this fact and train men so far as possible for both the engineering and the economics phases of business.

The Relation of Psychology to Business.—Business, no matter how hard it may try, can never eschew the human element altogether. We hear much these days to the effect that business has become cold, heartless and impersonal. There may be a tendency in that direction. But there is also a tendency for business men to realize more and more that they are having to deal with human materials as well as with bricks and steel and kilowatt-hours. There is, first of all, the labor force; then the buying public—the body of old

and potential customers of the concern; then the stockholders; then the public at large. The success of the business may depend upon how well any one or all of these groups of people are handled. All this human material has properties the same as have bricks and steel and electricity. These properties need to be analyzed and understood. The science which attempts to analyze these properties is *psychology*. It is a difficult science. Not much headway has been made with it as yet—in fact, so little headway that some insist that it has no present right to be called a science. Nevertheless, there is much that has already been learned that can be made useful to business men in their dealings with the workingman, in their advertising and selling, and in their general publicity. Schools of business are recognizing this these days and are developing courses in Employment Psychology, Advertising Psychology, Industrial Relations and the like.

The relation of economics to psychology, it will be apparent, is much the same as the relation of economics to physics and chemistry. Both are basic sciences. Each has a body of fundamental principles of its own, but the two become very closely interrelated in many of the concrete problems that business men have to handle. To illustrate, a drop in the price of peaches of twenty-five cents a crate may cause sales to increase twice as much if the psychology of it is properly handled than if it is not. Some factory operators, by handling properly the psychological problems involved, may pay lower wages than their competitors, have no strikes, and yet get more work done.

Private *vs.* National or Social Economics.—The discussion in the last three sections has been in terms of private economics—that is, the economics of private business enterprises. The majority of men are interested in what economics has to offer from this point of view particularly. They want to know what economics can teach them that will help them buy and sell more advantageously, and organize their enterprises more effectively. But we must not forget that all economic problems have their national and social aspects also. Political or state economics is still an economics of major importance. There is a growing tendency to call it "national economics." The Germans have called it by this name for several generations. The point of view in national economics is the well-being of the nation as the whole, the utilization of the human and natural resources of the nation as a whole in such a way as to secure the maximum advantage of all combined. It is proper to ask concerning every act of economic significance proposed whether it will benefit the nation and all indi-

viduals concerned at the same time, or some individuals only at the expense of other individuals, or the nation as a whole only at the expense of some of its members. By an intensive advertising campaign one manufacturer may perhaps expand his business greatly, but wholly at the expense of his competitors. This would be good economics from his point of view; but poor economics from a national point of view, first, because of the cost of the advertising, and second, because his factory is likely to be overworked in consequence while the others are operating under capacity. When the Eighteenth Amendment went into effect, it injured the immediate prospects of a large number of brewers, distillers, saloonkeepers and bartenders in the United States—this was done in the interests of national economy, at a time when the nation was waging war upon a stupendous scale, and the whole populace was roused to the need of utilizing all our resources to the greatest advantage of all.

Social economics is the same as national economics except that the point of view is that of *society* instead of the nation. What society is, is difficult to explain. It probably means the general body of people without regard to national aims and national boundary lines. It is generally assumed that national aims and the aims of society are one and the same. One would think that they surely ought to be. But there are enough instances upon record when they have not been the same so that it is advisable to distinguish between the two. It is doubtful, for example, if the national economic policies of the Germans in the reign of Kaiser Wilhelm were all good social economics, even from the point of view of the German people themselves. It is very doubtful if the present protective tariff policy of our government is good social economics.

In this textbook, the individual and the national and social point of view will be clearly distinguished. The national point of view will be considered especially in the last section of the book.

Economics and Government.—Obviously national economics and political science are very closely related. Political science is the science of the actual administration of public affairs. It deals with such questions as the powers of the chief executive, the interrelationship of the various branches of government, the bicameral or two-house arrangement for making laws, the method of choosing judges, the commission system of city governments, the methods of raising public revenue, the budget method of control of public expenditures, the ownership and control of public utilities, the public control and

public supervision of private enterprise. Some of these questions are almost purely questions of administrative organization, with few if any economic implications—such as the question of the powers of the chief executive. Others are hedged in at every angle by economic considerations—such as the question of methods of raising public revenues. It is impossible to raise public revenues without seriously affecting private economic activity. If the state spends the money, then the individual does not have it to spend. Then the question arises as to the purposes for which the state spends the money—the activities which are supported by it. Most of these activities are fundamentally economic in their nature, although they usually have broader implications, such as the public health, the public morals, national security and the like. This is certainly true of such public activities as municipal street lighting, the mail system, the official inspection of meat, the official grading of grain. A large proportion of the laws which are passed have many economic implications—take, for example, the tariff acts, the immigration laws, the national revenue acts, the laws regulating hours of labor and working conditions, the pure food laws, the corporation laws. The same is true of most public policies, whether national or state or local—for example, such policies as are involved in foreign loans, international trade agreements, federal aid to road-building, reservation by federal and state governments of mineral rights, municipal lighting systems, municipal subsidies to new industries.

Summary.—At this point we can probably summarize to good advantage our discussion of the nature and scope of economics.

1. *Economics has to do directly only with human activity.* It therefore belongs in the same class of sciences as political science and sociology, as distinguished from mathematics, physics, chemistry, biology, and the other natural sciences. One cannot study economics first-hand in the seclusion of a laboratory or in the wilderness—the laboratories of economics are our factories, workshops, farms and households; and its wildernesses are the busy marts of trade. To be sure, the human activity which economics considers is conditioned upon the laws of physics and chemistry and biology, and the economist must know and recognize these laws; but his studies are not of the laws themselves, but only of their bearing upon human activity.

2. *Economics has to do mostly with social activity.* This simply means that it does not ordinarily consider one human being at a time, as does psychology for the most part, and human physiology; but rather men

in their relations to each other, usually as groups, all the way from small groups like households, to large groups like nations. In this respect economics is like sociology and political science. In the modern world, the stimuli to which men react economically are largely from their social environment. Hence, economics deals almost solely with social activity.

3. *The science of economics considers social activity only from the standpoint of the utilization of human and natural resources.* The objective of economic science is the *economizing* of human energy, that is, making it go as far as possible, getting the largest possible returns from it. Natural resources are economized only in the sense that the more carefully they are husbanded, the farther they will make human resources go.

4. *Economic science considers utilization of human and natural resources in terms of value or price.* This is the final proposition which definitely distinguishes economics from the other social sciences.

5. *Economics is a science.* This means that it has a body of principles or laws like physics and chemistry. To be sure, these laws differ in some respects from the laws of physics and chemistry, being more conditioned upon other things and more involved, but they are none the less laws. The laws of the other *social* sciences, sociology and political science, are much like those of economics in this respect.

The foregoing statement must not be taken to mean that economics or any other science consists solely of a statement of principles. Usually the main principles of any science can be stated in a very few pages. It is the adaptations and exemplifications of the principles, together with the description of the phenomena in which they are manifested, that makes up the bulk of scientific treatises.

The Fields of Economics.—It is apparent by this time that the field of economics is very broad, including in one way or another almost all of human activity. The method of science is to divide, classify and organize; in one word, to systematize. The larger and more complex the field, the more difficult and more necessary this systematizing is. The first division of the field of economics is between *Production* and *Consumption*. All economic activity comes under one or the other of these two heads. The first of these is the subject of this treatise. But even this treatise will present only certain aspects of it. The consumption phases of human activity are now receiving increasing attention from economists. We are beginning to realize that how we utilize our product after we have produced it as is important as

the producing of it. But although production and consumption include all human activity, they do not include all aspects of it. The usual textbooks in economics also have sections devoted to Value and Price, Distribution, Exchange, Marketing, Transportation, Labor, Public Finance, etc. The sections on Value and Price endeavor to explain how the values or prices of commodities and services are determined. Since value and price is the central theme and final differentiating principle for all economics, this is a very important phase of the subject, and much attention must be given to it. This textbook omits all discussion of the bases of value and price. It talks about the effects of differences in price, or changes in price, upon the organization of production, but it does not attempt to explain how any prices come to be.

Distribution deals with wages, rent, interest, and profits, which are merely names for the prices paid for the different elements used in production. It is therefore merely a further development of Value and Price. The price-making process determines the relative values placed upon different commodities and services, and hence also upon all the things that are used in the production of these commodities and services. Wages therefore result from price-making processes, and likewise rent, interest and profits. The major interest in economics in the past hundred years has been in Distribution. The public has been greatly concerned with the division of the income of society between labor, land and capital, and between the different economic classes. The labor movement and the growth of socialism has greatly stimulated interest in this problem. It has been pointed out frequently of late, however, that if all income, let us say, above three thousand dollars a year per person, in the United States were pared off and distributed equally over the remaining population, less than a hundred dollars would be added to the income of each person. Obviously if the condition of mankind is to be greatly improved, some means must be found for increasing still further the per capita production.

Exchange is the name given to that division of economics which deals with the transfer of ownership of goods and services, and the use of money and credit in facilitating this transfer. The exchange of commodities and services, commonly called marketing, is, as we shall see presently, a form of production. Attention must therefore be given to certain aspects of it in this treatise. The same is true of Transportation. Most general treatises in economics have a section devoted to Labor, in which labor is considered from several angles, one

of them being its rôle in production. Labor will be considered from this latter angle, in certain chapters in this volume. Public Finance, when included in general textbooks in economics, concerns itself with the collection of public revenues and administration of their expenditure. Certain phases of it relate primarily to production, to what may be called *public production*, and will be discussed briefly in the final chapters of this book.

PROBLEMS

1. Show how a person who takes good care of his clothes is really economizing human effort.
2. An engine is invented which is 50 per cent more efficient in the utilization of fuel. Explain why the general adoption of this invention would constitute a more economical use of labor.
3. Give three instances where natural resources may be substituted for labor.
4. Give three instances where economizing has been carried too far. Give your reasons for thinking each is poor economy.
5. It is proposed that Canada and the United States cöoperate in the opening of the St. Lawrence river and the Great Lakes to ocean-going traffic. List at least three problems involved in this enterprise which are not economic. List five which are economic problems.
6. It has been reported that a method for transmutation of metals (*e. g.*, mercury into gold) has been discovered. If successful, how would it result in a more economical utilization of labor? Of natural resources? How will economic considerations affect the practicability of the method?
7. Show that "a child labor law" involves political science, sociology, biology and economics.
8. The island upon which Robinson Crusoe was shipwrecked had always produced many things suitable for human consumption. When did these products first come to have value?
9. "Robinson Crusoe's problem was to economize the goods saved from the ship and not his labor." Is this true?
10. Distinguish between pure and applied science and illustrate each with an example of your own.
11. What development in human activity has caused economics to become of greater significance?
12. Business men as well as students often say, "That's all right in theory, but it will not work in practice." What do they mean?
13. Take some business enterprise with which you are familiar and make a list of the economic questions involved in it. What will be the relation of pure economics to the solution of these questions?
14. In what way will the business man employ both economics and psychology in the management of his business?
15. Give three examples of how the individual point of view may differ from that of society or the nation.

16. How may economic conditions become involved in the problems of local, state and national governments?
17. Professor R. T. Ely defines economics as "the science which treats of those social phenomena that are due to the wealth-getting and wealth-using activities of man." Does this definition include each of the five points about economics covered in this chapter?
18. Economics is a comparatively new science; but are economic principles something new?
19. What is the difference between principles and facts? How are they related in solving economic problems?
20. Why should every person that is or will become a voter know something about economics?
21. What is the difference between the popular and economic meaning of the term distribution?
22. Many business men follow a "rule of thumb" procedure. Are they following economic principles?
23. Refer to the definition of exchange given in this chapter. Why may exchange properly be considered a division of economics?

CHAPTER II

THE NATURE OF PRODUCTION

The objective in this chapter is to obtain an understanding of the nature of production and the production processes. Production, we shall discover, takes many different forms. Almost any commodity in everyday use will serve to illustrate this. The suit of clothes I am wearing probably started away back on the sheep ranges of Australia, in the coal mines of Ohio, the forests of Washington, and the iron mines of Minnesota. The sheep were cared for from season to season by herdsmen, and in the spring the wool was sheared and bundled and hauled in wagons to a local market, where perhaps it was bought by a wool buyer who may in turn have sold it to a wool dealer, who put it into storage until such time as he could sell it to a woolen manufacturer. One manufacturer washed the wool, scoured out its grease, and spun it into yarn; a second wove it into cloth, and a third made it into suits. Anywhere between these three manufacturers may have been middlemen of various kinds who helped with the buying and selling; and of course the goods had to be transported from one to the other. A traveling salesman probably acted as intermediary between the manufacturers and the retailers, and a whole staff of salesmen helped me buy it at my favorite department store. A delivery boy left the suit at my door. Coal miners dug the coal that heated all the various establishments handling the product; also the coal used in the factories that made the machines. Other miners dug the iron used in the machines. Lumbermen felled the trees and sawed the lumber for the buildings. A whole series of bankers helped finance all these transactions. The post-office department handled the mail for them. The police department protected all the various establishments against theft, the fire department against fire. The legislatures and Congress made the laws providing banking service, mail service, and police and fire protection. The courts interpreted these laws and enforced the contracts. Our schools trained the lawmakers and the lawyers, not to mention all the other workers. All of these activities are production. All the types of production represented by them must be included in our analysis of the production process.

I. PRODUCTION DEFINED

As a first step in our analysis, we must distinguish between production and consumption. Eating, drinking, sleeping, listening to music, playing golf for sport, are obvious forms of consumption. So also are dancing (not stage dancing), reading fiction, and pleasure riding. Living in a house is consuming it. In all these activities, an individual is *himself satisfying an immediate personal want.* In production activity, the individual is either trying to *satisfy somebody else's immediate wants,*—as, for example, by singing to him or transporting him; or is *making a change in some commodity intended to cause it to satisfy a greater want*—as, for example, by grinding wheat into flour, or baking flour into bread, or shining a pair of shoes; or, lastly, is causing some change in himself or in other persons that is intended to result in the satisfying of his wants or their wants or other persons' wants later—as, for example, by studying to become an engineer or a violinist, or by teaching others engineering or violin playing. This indeed looks like a motley array of activities to include in one concept. Closer inspection, however, discovers a certain amount of order among them. It appears that production activity is *always intended either to satisfy somebody else's wants, or to build up potential want-satisfying power in something or somebody.* This somebody may be one's self. If we are satisfying our own immediate wants, as when eating, or automobile riding for pleasure, or dancing, we are consuming and not producing. If we are satisfying the wants of others, as when transporting them, or entertaining them, or are doing things for ourselves from which we will derive satisfaction later, as when shining our own shoes, we are producing and not consuming.

The distinction between production and consumption is commonly made in this form: Consumption satisfies human wants directly, and production only indirectly. Thus when I am wearing a suit of clothes, I am satisfying a want of mine directly; but the farmer who produced the wool, and the factories which spun the yarn, wove the cloth and made the suit, were satisfying no wants of their own directly, nor my want directly—they were merely getting something in condition to be used in satisfying a want later. As has been said many times, the manufacturer of nails cannot very well eat them, or wear them, or make any use of them whatever that will minister directly to his own personal needs. It is only when the nails have been incorporated in a house and someone begins to live in the house that they can be said

to be used directly in consumption. Every use made of the nails until the house begins to be lived in, only indirectly satisfies a human want, and hence is production. While this is a useful distinction, it does not cover the case of a person fitting himself to be more productive later, or better to satisfy his own immediate wants later, which are both included in production in the statement in the foregoing paragraph.[1]

Perhaps it will clarify the concept of production to consider a number of different types of human activity and see whether they are production or consumption. A painter at his easel ordinarily is producing. He is producing something which will presently satisfy a human want. But he may be painting merely for the pleasure of it. Artists still have moments of inspiration when their work is a sheer delight to them. In such a case, they are consuming at the same time that they are producing—the two forms of activity are going on simultaneously. There is a good deal of this in the world. Most workers derive some direct satisfaction from their work. It is very fortunate that this is the case; for if it was not, much of the most worth-while work would never be done.

A man playing golf, unless he is a professional, is consuming only; but his caddy is producing. The caddy does not ordinarily lug a bag of golf sticks around all afternoon merely for the personal pleasure he derives from it—he does it to satisfy a want of somebody else. If, however, the caddy gets a measure of personal enjoyment from the task, as already explained, then to that extent he is consuming at the same time that he is producing. A boy who is caddy for a professional golf player is producing also, but for a slightly different reason—he is helping somebody else satisfy the human wants of others. Thus his production is more indirect.

A chauffeur driving a car for his employer is producing, perhaps for the reason that he is helping his employer enjoy himself, the same as is the caddy, or perhaps for the reason that he is assisting his employer with his business duties. If the chauffeur enjoys his work, he is consuming at the same time that he is producing, just the same as is the caddy. A man driving his own car may be doing it purely for pleasure, in which case it is consumption; or entirely as part of his regular work or business, in which case it is pure production; or for both of these reasons combined.

[1] A number of economists hold that self-improvement is a form of consumption rather than of production. A brief statement of this position may be found in Professor T. N. Carver's *Principles of National Economy* (1921), p. 572, and in Professor Frank A. Fetter's *Economic Principles*, Vol. I (1916), p. 296.

Obviously the bootblack who shines your shoes is producing. It may not be so clear that you would also be producing if you were to shine your own shoes; but such is the case. The consumption does not begin until after the shoes have been shined.

The housewife preparing a meal is producing; likewise when she is serving it. The consumption begins with the eating of the food, or perhaps with the anticipations of pleasure from eating it that comes with the sight or odor of it.

The railroad which transports me is producing—it is satisfying my desire to be in a particular place, or to travel over a particular route. If I were to walk to the place, I would also be producing. The only kind of walking which is purely consumption is that which is for the sole pleasure of the physical exercise of walking.

Attention is called to the word *intended* which is included in all the foregoing statements concerning production. There is considerable activity in the world which is intended to help satisfy wants, but fails of its purpose. Thus, an attempt to grow a crop of wheat may fail of its purpose because of lack of rain. Since it cannot be called consumption, it must either be given a special category of its own or called a form of production. The latter seems the more reasonable procedure. It perhaps should be pointed out also that consumption activity frequently fails to satisfy one's wants—the music, for example, may be tiresome, the golf maddening, the food nauseating.

II. WANTS

The ultimate aim of all production is to satisfy immediate human wants. No doubt much light could be thrown upon the process of production by an analysis of the nature of the wants thus to be satisfied. No doubt we could do a better job of satisfying them if we knew more about them. But this is a job for the psychologists; and unfortunately the psychologists have made little headway with it as yet—the science of psychology is just at its beginning. It is surely safe to say that human wants are extremely varied, at least in their superficial manifestations. Some of the names that have grown up in our language to designate the different superficial forms that human desire takes are the following: Hunger, thirst, sex desire, love of warmth, love of ease, desire for power or glory, love of liberty, desire for sociability, desire for revenge, love and hate, fear, aversion to pain, desire for recreation or play, love of self-expression, religious desire, love of the beautiful, desire for knowledge, love of fair play

or justice.[1] Science may prove these names to be very misleading; but nevertheless the names will persist. Languages are made and perpetuated mostly by people without scientific training. Whatever the essential nature of these numerous wants, any one of them in the sense in which it is popularly understood may be the ultimate object of a production act.

Although the economist can say nothing about the nature of the want satisfied, he can discuss the nature of the *things that do the satisfying*. The first classification to be made under this head distinguishes between (a) *material goods*, and (b) *personal services*. Material goods include such things as food, clothing, automobiles, books, pictures, musical instruments. Personal services include such things as singing, acting, teaching, baseball playing; also transporting of persons traveling for pleasure, and transmitting of personal information by telephone, telegraph or cable.

In the last analysis, the power of material goods to satisfy wants is a matter of persons and not of things. No property of a commodity can cause it to satisfy a want unless some person is disposed to want the commodity because of this property. Numerous properties of many commodities represent no power whatever to satisfy wants. Also, as we shall see later, the power of a commodity to satisfy wants may greatly increase or decrease without any change taking place in any of its properties. Nevertheless, most of the want-satisfying power of goods does definitely relate to circumstances associated with the goods themselves; and it happens that actual production concerns itself a great deal with affecting these circumstances, and very little with affecting persons so as to make them want goods more or less. The circumstances relating to goods which are affected by production activities would take a whole dictionary to present. For example, food satisfies because of the number of calories of energy it provides, the amount and quality of its protein, its vitamin values, its digestibility, its bulk, its texture, its flavor, its color, etc.; also because of the time when it is available, and the place where it is available. It has become customary, however, to attempt to crowd all of these circumstances into four groups as follows: properties of *form* or *substance*, circumstances of *place* or *position* where available, circumstances of *time* when available, and circumstances of *ownership*.

Most of the illustrations which we have thus far used have involved the *form* or *substance* of commodities. This means that there is some-

[1] E. A. Ross, *The Foundations of Sociology*, Macmillan, 1910, p. 169.

thing about the shape or size or arrangement or structure or texture or condition or composition or color or taste or smell of these commodities which gives them power to satisfy wants. The want-satisfying properties of a suit which one is wearing are properties of form; likewise of the beverage one is drinking, or of the picture on the wall.

But the *place* or *position* of a commodity is also an important circumstance. A commodity which is in Madagascar when all the people who want it are in Europe has no want-satisfying power unless it can be transported to Europe. A picture does not have full want-satisfying power until it is hung in its proper place on the wall. Our whole transportation system is engaged in increasing the want-satisfying power of commodities either by moving them to the places where they are wanted, or by moving persons to the places where the commodities are available. The boy who delivers our newspapers is creating want-satisfying power in terms of place; likewise the telephone and telegraph.

The third class of circumstances relate to the *time* when the commodity is available. If the peach crop is larger than can be consumed as it ripens, the surplus has no power to satisfy wants unless some way can be found of storing or preserving it till such time as it is wanted. The meat supply of Argentina had little value—cattle were slaughtered merely for their hides—until refrigeration methods were developed about 1880. Even non-perishables like wheat, cotton and wool must be protected from the weather. Frequently a considerable part of a grain or cotton crop is carried over into the next year. The only agencies exclusively engaged in satisfying wants as to time are the storage companies; but many types of agencies combine storage with other functions. For example, the merchant who keeps a stock of goods on hand awaiting the call of his customers is creating want-satisfying power in terms of time.

Many of our wants are definitely associated with the *ownership* of things rather than some property of the things themselves. In many cases, ownership is necessary before the good can satisfy our wants properly. No one will dispute this in the case of clothes or toothbrushes or lap dogs. It is true to a large extent for land, houses, automobiles, books, pictures, musical instruments. Hence possession must really be looked upon as a fourth circumstance determining power of things to satisfy wants.

This same grouping can be applied to services as well as to material goods. Different services have essentially different properties of

form—being sung to is very different from being lectured to or from being transported. The barber produces changes in form. The passenger train produces changes in place; it may also be said to produce changes in time, since it gets a person to the place to which he wants to go sooner than he could get there himself. The telephone and telegraph create time changes in this same sense. The period of time in which a physician can be obtained to-day as compared with a century ago, is a splendid example of service production of which time is almost the essence. Hence it appears that service production creates the same types of changes that commodity production does. There is, of course, some service production which is hard to fit into any of these categories: for example, it is refining a good deal to say that a singer is producing changes of form in the ear membranes of his audience; or that a lecturer is producing changes of form in the brain cells of his students. Nevertheless it is the truth.

However, it is not necessary that all production changes shall fit into these four groups. They are introduced only for the sake of convenience in discussion, and if it confuses more than it helps to force a particular change into one of these groups, it had better not be done.

III. COMMODITY PRODUCTION

We are now ready to take up our analysis of the production process itself. Let us begin with some of the simpler forms of production activity.

Simple Production Processes.—The simplest example of production that one can name is one person working with his bare hands upon a product for his own personal consumption—such as illustrated by a South Sea Islander shaking down a cocoanut for his own meal, or a native Indian picking berries just before eating them. Such processes are so simple that it seems somewhat preposterous to analyze them; yet it is from just such elementary manifestations as these that we get our clearest notions of many things. The operating of picking berries for a meal illustrates two phases of the production process, namely, *appreciation*, and *conversion of human energy*. Whenever a commodity is changed so that it satisfies a greater human want than before, or is put into a condition to make a greater contribution to satisfying a human want than before, it is said to have appreciated. Potatoes appreciate in cooking, cloth in being made into clothes, wheat in being ground into flour and by-products, apples in ripening,

and berries in being picked. Appreciation, we shall see later, is involved in any operation resulting in the production of a commodity. *Conversion of human energy* is also fundamental to almost any sort of a production process. There can ordinarily be no production without the putting forth of human effort of one form or another. This putting forth of human effort uses up some of the energy of the human body. Thus human energy, as such, disappears, but there appears in place of it some change in the commodity worked upon, a change which puts the commodity in a condition to satisfy a greater want than before. Thus human energy has been *converted* into want-satisfying power, into *appreciation*. These two processes of course go on simultaneously—the same act that robs the human body of some of its store of energy also adds to the want-satisfying power of the commodity. They are therefore not two parts of the production process, but two phases of it.

As already explained, the power of goods to satisfy wants may depend upon a variety of circumstances with respect to them, such as their *form* or *substances*, their *place or location*, the time when they are available, and their *ownership or possession*. If goods appreciate in production, then they must undergo change in these things which determine their power to satisfy human wants. They must undergo change in form or substance or place or time, or possession, or some combination of these, or perhaps some other type of change not included in this list. In the examples chosen, picking berries and gathering cocoanuts, the changes wrought are in form and place, mostly place. If the gatherers were to collect more berries or cocoanuts than they could consume themselves, and should carry some of them home and store them for later use, they would be causing *time* as well as *place* changes. The process would be production because the berries and cocoanuts would satisfy a greater want later than at the time of gathering. Or if instead of storing them for later use of their own, they transferred them to others in the group who had been unable to gather them for themselves, they would be causing *possession* changes. And the process would be production because the berries and cocoanuts would satisfy a greater want so consumed than if consumed by those gathering them. The present wants of others in the group might easily be greater than the later wants of those who gathered them.

Production with Machines and Tools.—Very little production, however, is with the bare hands. Usually a tool or a machine of some kind is used. For example, the huntsman desiring fuel for

his fire uses an ax to fell a tree and cut it into lengths, the miller grinding wheat into flour uses a steel rolling mill driven by water power or steam or electricity. Now each time that a tool or machine is used in production, something is taken from it. A machine starts out upon its production history new and complete in every respect. The end of each act of production finds it something less than before the act. The gradual using-up of tools and machines in production is known as *depreciation*, the third phase of the production process. Depreciation occurs whenever tools or machines are used. That which is taken from the machine, although it disappears in its original form, is really added to the commodities upon which it is used. But it is added in an entirely different form. In the pair of shoes that has been soled is no apparent portion of the machine which did the job; or on the printed page is no apparent portion of the machine which did the printing. What was the machine is now represented by changes in the form or substance of the product. A conversion has taken place much like that when human energy is converted into form or substance changes.

It is obvious that buildings depreciate like tools and machines. Each barrel of flour turned out from a mill contains a small portion of the value of the mill building as well as of the milling equipment.

Machines and buildings also depreciate merely with age, buildings more than machines because of exposure to the weather.

Human beings, it will be apparent, also depreciate both with use and with age, but especially with age. Most of the energy which is converted into production changes is quickly restored again with rest, and food, and drink; but not all of it. That which is not restored means depreciation. Part of that which is not restored is due to age.

Production Using Supplies and Materials.—The fourth process included in production is the apparent complete disappearance of some commodities altogether. The coal that is burned under the boiler, the polish or stain that is applied to the oak table, the seeds that are planted, are examples of this. It is not so much that they disappear, as that they change or lose their form so as to be unrecognizable. The smooth planed surface of a board does not look much like the coal that furnished the power that drove the planer; nor the polished table top like the liquid varnish. There is no word in the English language that fits this process. Perhaps we can call it *form-losing*. It is obviously one of the most important of the constituent processes of production. A considerable part of the form of finished goods comes into being only by the complete annihilation of other

goods. The most important examples of supplies or materials so used are fuel and feed.

In economic discussion, it is customary to refer to fuel, feed and other production goods which are used up in one production process, as *circulating*, and those which are used over and over again, like buildings and machines, as *fixed*. The first undergo *form-losing* in production; the second, depreciation. While it might be possible to draw a hard and fast line between the two classes of goods, it would not be worth while. For example, will it help greatly to put an article which is used two or three times in production—like a safety razor blade—definitely in one class or the other?

Manufacturing Production.—Ordinary manufacturing production usually includes all the four processes above named—appreciation, conversion of human energy, depreciation, and form-losing. A manufacturing plant takes raw materials and causes them to appreciate, this appreciation being accompanied by and resulting from the form-losing of supplies, the depreciation of machines and tools, and the conversion of human energy. The appreciation in manufacturing consists mostly of changes in form or substance, but there is always some change in time and place—that is, it is not possible to operate a manufacturing plant without some storing of raw materials, supplies, partly finished and finished goods; and without some moving of these things from place to place in the plant. Much of the form-losing of manufacturing plants takes place because they produce their own power, which requires, except in the case of water-power plants, the using of large quantities of fuel.

Few manufacturing plants indeed turn out finished goods ready for direct consumption. The bread must first be sold at retail, and delivered to the customers. Canned goods must be shipped long distances and frequently pass through the hands of brokers and jobbers as well as retailers. Many manufacturing plants, moreover, are so far removed from the actual finished goods that they make only the machines or the materials that are to be used by others in later stages of the manufacturing process. Behind the baker is the miller, the farmer, the manufacturer of milling machines and bake-ovens, the builders of plants, and the manufacturers of the building materials used in plants. In the manufacturing of machines, that which appreciates is the machine which is being manufactured.

Roundabout Production.—Whenever production is carried on with machinery, tools and buildings, the production process is pro-

longed. The machines have to be completely manufactured before production of the commodity itself can be started, and not until the machine is completely worn out is its rôle in production completed. Such production cannot be said to be creating satisfaction directly. No one would maintain that a blast furnace, other than as a spectacle, itself satisfied any human wants. Such goods have no power to satisfy human wants until some further work is done with them. The reason for such production is the hope of securing ultimately a larger product, or of satisfying in the end the same wants with less effort. Boehm-Bawerk compared three ways in which a primitive man might obtain water from a hillside spring; one, by climbing to the spring each time a drink was wanted; another, by fashioning a wooden vessel and carrying down a day's supply at a time; and third, by building a wooden trough so that he would never have to climb the hill again. While he was making the trough, he could not be hunting and fishing and supplying his other wants directly; but if he could curtail these other wants for a while and build a trough, he would presently have much more time for hunting and fishing. Boehm-Bawerk designated such production by the term "roundabout." Roundabout production is to-day the usual form of production. Production has been getting more and more roundabout all of the time. A large percentage of the people of modern occidental nations are engaged in making tools and machines and in building factories and railroads. As a result, the per capita product has been very greatly increased, and men are able to-day to satisfy more varied and more numerous wants than ever before.

Production in Stages.—Roundabout production in the modern world carries along with it a good deal of production in stages. Thus the mining of the iron ore is one stage, the concentrating of it is another, the smelting of it is another, the converting of it into steel is another, and the rolling of the car rails is another. These different operations are usually carried on in different establishments, often a long way apart, so that the goods have to be transported from one to the other. The finished product of one establishment becomes the raw material of the next in line in the production process. Strictly speaking, the last establishment in the chain is usually the retailer who sells the goods to the consumer, or in many cases, the household which prepares the goods for final consumption. The goods are not really finished until they are in the hands of the consumer ready to be consumed at once without further work upon them. Examples of strictly finished goods are the food served you at a hotel or restaurant,

the clothes delivered at your door by a department store or made for you by a tailor, the house built you by a carpenter. The food products turned out by a factory must first be transported by rail, then trucked from the freight station to a store, held in stock for some time on the shelves of merchants, sold to the particular persons wanting them, delivered to the door of the persons buying them, in some cases held for a period on pantry shelves, and finally prepared for the table and served. Only in the very last form are they completely finished goods. The most important institution producing actual finished goods is after all the household.

Most production therefore takes commodities only part of the way along the road toward the final consumer. Most commodities at any one time are actually in the class of partly finished goods—they are somewhere on the way to final goods. Goods thus on their way to becoming final goods are commonly referred to as partly finished goods, or "goods in process." They may be looked upon "in process" within a particular plant, or in process somewhere in the whole production process. Often they are being held in stock as raw materials of one plant or as the finished product of another.

Capital Goods.—To partly finished goods, or goods in process, and roundabout production goods, economists have generally given the name *capital goods*, which they have defined as *products of past effort used as aids in further production.* The class of goods included under this head is very large—it comprises tools, machines, buildings, land improvements, live stock of all kinds, commodities of all kinds in storage, or on shelves of merchants awaiting sale. In fact, strictly speaking, it includes all goods until they reach the hands of the final consumer, and the actual consumption of them begins.

There is, however, a certain inconsistency in putting goods in process and machines, tools, buildings, and the like all in one category. They do not, as a matter of fact, behave the same in production. Goods in process normally appreciate in the production process, while machines and the like normally depreciate, and supplies lose their form. This fundamental difference is probably recognized in common usage. Thus we speak of the "productivity" of machines, factories, work animals, dairy cows and the like, and not of their power to satisfy wants. It is recognized that they make their contribution to satisfying human wants only indirectly. To goods in process, however, we seldom apply the term productivity. While they are not able to satisfy human wants in their partly finished form, nevertheless they

are approaching that condition, and the changes that are being wrought upon them are usually merely modifications of properties which they already possess. Thus the finished shoe has in it the essential properties of the various hides from which the leathers were made.

Productivity.—It should be pointed out at this time, however, that no one machine or tool or cow, or piece of land, is able to produce alone unaided. Production requires at least two agents or elements of production. We shall see later that the amount of the product depends upon the contribution of all the agents or elements of production. Moreover, the efficiency of one element depends upon the efficiency of the others. It is therefore possible to speak of the absolute productivity only of a combination of elements of production, and not of any one element. For example, the amount of flour turned out by a mill depends upon the efficiency of both the miller and the milling machine. We therefore cannot speak with accuracy of the absolute productivity of either one separately.

Agricultural Production.—A farm is somewhat like a manufacturing plant in its production processes. The principal changes produced are those of form or substance. The raw material of crop production is the seed. The supplies are the fertilizer, twine, sprays, and the like. The rôle played by land, however, is peculiar. Land may either appreciate or depreciate in use; it may depreciate in certain ways while appreciating in other ways. This will be discussed later. Work stock such as horses may be looked upon as machines, depreciating while in use, and also as human beings, having their muscular energy converted into changes in the commodity worked upon. Meat animals may be looked upon as machines, the product being the gain in weight and quality of meat; or they may be looked upon as raw materials being worked upon. Animals yielding a product, like dairy cows, really have to be looked upon as machines. Although the changes produced upon a farm are mostly those of form or substance, there is much transporting of supplies and products, and frequently much storing of products.

Transportation Production.—The principal process taking place in transportation of commodities is the appreciation of the commodity being transported. This appreciation results because the commodity is transported from a place where it is less wanted to a place where it is more wanted. If the commodity, however, is a perishable one, it may depreciate from loss of quality more than it gains

from transportation. The simplest kind of transportation—by human pack—involves simply the conversion of human energy and human depreciation. Travelers in the interior of Africa find this the only available means of transportation. The next stage, transportation by pack animals, such as horses, mules, camels, elephants, llamas, dogs, involves in addition the conversion of muscular energy and depreciation of the pack animals. Wagon hauling introduces the depreciation of equipment; and train and truck hauling the using-up of fuel, oil and other supplies.

Storage Production.—The appreciation taking place in storage production is the appreciation of a commodity being held over from a time when it is less wanted to a time when it is wanted more. A perishable commodity may of course lose in quality more than enough to offset its appreciation from holding. Ordinary storage involves buildings mostly, but a considerable amount of handling must usually go with it, this frequently requiring unloading, loading and elevating equipment of various kinds. Cold storage involves in addition the use of ice or of refrigeration machinery.

IV. PERSONAL SERVICE PRODUCTION

The production which we have thus far described has all resulted in changes to commodities, either in their form or substance, or place, or time, or possession. We shall now need to consider various forms of production in which no commodity is involved, but instead the changes are realized directly by the individual whose wants are being satisfied. Such production is usually called *service production.* The difference between production of goods and production of services can be illustrated most simply by the case of transportation. We say that the railroads produce place changes when they bring commodities to us. These changes are stored up in the commodities. The commodities satisfy our wants better after they are transported than before because they are where we can use them. Of course only by using or consuming these commodities do we realize the advantages of this transportation. Suppose instead of transporting commodities, the railroads transport persons. In this case, the changes are realized directly by the persons transported. Another simple illustration: I have a choice between hearing a distinguished scientist in lecture and reading his latest volume of researches. In the first case, I will be having my wants satisfied directly, in the form of personal service production; in the second place, indirectly though the book he has

written, in which he has stored up the results of his studies for our use. Other examples of personal service production are the services of ushers, barbers, hairdressers, dentists, physicians and singers.

Some service production produces changes in persons that are mostly converted into satisfactions immediately, most of the effects of which soon disappear—all forms of entertainment are largely of this description. In such cases, production and consumption occur almost simultaneously. At the other extreme is service production which produces changes in persons which are likely to last a long time, such as treatment of the teeth, reading, education and physical training. This latter type of service production suggests commodity production in that there is a semblance of the same storing process involved. The storing, however, is in persons, not in commodities.

The essential difference between commodity and service production is that commodity production represents human effort applied to commodities, whereas service production represents human effort applied to other persons. One consists of changes to commodities, the other of changes to persons. An incidental difference is that commodity production always stores up changes to be later realized in consumption, whereas service production frequently involves consumption contemporaneously with production.

If this distinction is strictly applied, however, a considerable part of what is ordinarily called service production will be ruled out of this class—for example, the services of hotel or train porters, or waitresses, or bootblacks, which are really stored up in things rather than in persons. The period for which they are stored, however, is relatively brief, and the things in which the changes are stored are so closely associated with the person—clothes, for example,—that common usage refers to them as personal service production. They will be so named in this treatise.

In the early days of economic science, many were disposed to argue that rendering personal service was not production because it did not leave behind any tangible physical product; and even to-day, one still hears this thought occasionally expressed. The argument is not sound, and arises from a misconception of the nature of production. Production does not create goods, but want-satisfying power in goods. Is it not as essential to transport persons to where commodities are as to transport commodities to them? The argument also fails to recognize that there is much personal service production which stores up benefits in persons which are of lasting nature and may mean more in the

future than the changes stored up in commodities. The personal service production of teachers, scientific workers, statesmen, public officials, physicians, dentists, nurses and the like is distinctly of this sort.

Society has need of a great deal of commodity production. Without a great deal of it, we would live a largely hand-to-mouth existence. Even insects acknowledge by their behavior the necessity of storing up changes in commodities. Not only do they collect and store food supplies—but bees and ants, for example, even manufacture food supplies. Society also has need of the kind of service production which stores up benefits or satisfactions. Without it there would be no individual progress, and no race progress. Our generation is frequently criticized because too large a proportion of its abundance is converted into physical improvements rather than human betterments.

Society also has need of those personal services whose benefits result in mostly momentary satisfactions. The sundry annoyances of hotel porters and their kind might well be dispensed with; but not the delight and inspiration we receive from actors and musicians; nor even the more humble services of barbers, waitresses and bootblacks.

It should also be pointed out that the changes created in commodities vanish once the commodities have been consumed. And some commodities are so perishable that they must be consumed almost at once if their satisfactions are to be realized. The difference is therefore only a difference in the time at which the consumption takes place—and in some cases, consumption is postponed for only a very brief period.

Furthermore, there is no merit in and of itself in postponing consumption or keeping satisfactions stored up in commodities. Only if such a dispensation results in a better utilization of human and natural resources, is it any improvement upon immediate consumption. It may well be that the more lasting benefits resulting from certain types of services may contribute more to human well-being than the transitory satisfactions derived from commodities whose consumption is somewhat postponed.

In its pure form, service production involves a very simple process. Very little in the way of raw materials is needed. Very few tools are needed. The process is the conversion of human energy and such depreciation as goes with this. The productivity is mostly stored up in the person rendering the service. The person rendering the service may be highly skilled—for example, a surgeon or an opera singer.

The complicated part of service production is not so much in the acts of production themselves, but in training or preparing persons to perform them.

If service production is not of the pure sort, being associated with commodities and rendered through or by means of commodities, the act of production may be a complicated one, involving raw materials and capital goods in abundance and an elaborate organization. Take, for example, the railway service of transporting persons traveling for pleasure, the tourist hotel, the theater, the university or the hospital. Such service production may include appreciation, depreciation, form-losing and all the complicated processes of commodity production. Where a building is involved, such as a theater, or a university building, or equipment of any kind, such as a passenger coach or locomotive, depreciation is an important part of the process. Or materials may be involved which lose their form in the process—for example, the coal burned in the passenger locomotive; or other materials or partly finished goods which appreciate at some stages during the process before reaching the point of human consumption, such as food being prepared for the table.

Self-improvement.—Improvements to other persons which make them more productive, we have recognized as a form of production. But so also are improvements which we make upon ourselves, which make us more productive. This is the only logical conclusion we can come to. To the extent that we labor with ourselves and go through a course of training for the sake of making ourselves more useful afterwards, we are engaged in production. If, however, we get any personal satisfaction out of it while we are doing it, then to that extent it is consumption. As already explained, much productive effort carries some immediate satisfaction along with it. Here is a case where the immediate satisfaction is oftentimes more important than the production. Most of the personal satisfaction which we realize because of having improved ourselves in various ways, is, however, realized subsequently and not while we are doing the improving. A man shaving himself is producing—the satisfaction comes later. So largely with a man educating himself.

V. SERVICE AND COMMODITY PRODUCTION COMBINED

The remaining types or forms of production involve changes to persons mostly, but not altogether. It is therefore thought best to group them apart.

Choosing as Production.—An unusually interesting and difficult form of production has to do with the choosing of goods and services. Before eating can begin, a *decision* or *choice* has to be made as to what will be eaten. The suit of clothes has to be chosen before it can be worn. The house has to be selected before it can be lived in. A choice has to be made as to whether to spend one's dollars for food or clothing or shelter; or for better food, or better clothes or better shelter. Or for recreation in place of clothes. Or for books and learning in place of clothes and recreation. Or in pursuit of fame in place of recreation and sociability. The choice may be between goods or services to use in commodity production, or to use in service production. The choice of services may be for immediate consumption, or for some benefits which will yield satisfactions mostly later. The choosing may be for one's self, or for somebody else. The hotel-keeper plans part of our meals for us. The housekeeper not only chooses the food for the family, but in most cases a good share of the clothing and house furnishings. There can be no question about these being production. But choosing food, clothing or recreation for oneself are as surely production. One will surely not say that the housewife is producing when she shops for her family, but not when she shops for herself. Decisions also have to be made as to the utilization of one's time and energy in direct consumption—reading, walking, traveling, attending the theater, playing games, resting, etc.

There is always danger of a misconception at this point. Discussion such as the foregoing unavoidably suggests an individual making a conscious rational choice as to how he will spend his money and his time. Such a description does not fit man as we now know him to be. Man is not always rational in making his consumption choices. Probably a majority of his "decisions" are merely functionings of habit or custom or tradition or suggestion or are "accidental." In other cases, he does some deliberating, but not enough to overcome the force of habit or custom.

Many modern psychologists object even to using the term "choice" in such circumstances. They say that even our so-called choices are all predetermined by our individual experiences. We are not interested in this treatise, however, in the question as to whether man is something of a free agent or a mere mechanism in making a choice. The point is that any one of several things may usually be done—*one* is done. A *process* has taken place here. It may be that kind of a

process which people generally call *rational choice.* Or it may be the process which they call habit or *custom* or *tradition;* or the process which they call *suggestion;* etc.[1]

Household Production.—Much of the production carried on in households is more nearly commodity than service production. Many of the changes created are stored up in the furnishings of the home, in the food being prepared for consumption, and in the clothes being made ready for wearing. But the period of the storing is very brief, and the things in which stored highly personal, so that it seems only natural and practicable to accept common usage and call such production service production. There is also combined with many of these activities the giving of a good deal of comfort and pleasure of a very direct sort.

The depreciation of the house and of equipment, and the form-losing of food, fuel and other supplies, are important processes in household production, but of most importance is the tremendous conversion of human energy involved. It is no mere incident of civilization that in 1920 over twenty-seven million women and girls fifteen years old and over were reported as engaged in taking care of our twenty-four million households. The human energy involved in rearing the average family of over four children to the age of independence, not including the energy expended in earning the necessary income for it, represents by far the largest single item in the family economy.

Merchandising.—The important process included in merchandising is appreciation by changes in possession, by getting commodities or services out of the hands of persons who want them less and into the hands of persons who want them more. One of the purest types of creators of possession satisfaction is the real estate agent. Smith wishes to buy an eight-room house, with hot-water heat, not too old with an extra large lot, or preferably two lots, located in a certain residence section, not on a car-line, but not too far from a car-line. He might spend all his spare time for weeks looking for such a house and not find it. Jones, the real estate agent, has a list of most of the houses for sale in the district, together with descriptions and prices. He stands a very good chance of showing Smith the particular house that comes nearest to meeting his needs, and doing it

[1] The psychologists who object to the use of the term choice will either have to force the word out of the language, and its equivalent out of all languages, or continue to use it but try to get people to have a new understanding of it. The latter seems much more in keeping with past intellectual history.

in a day or two. By dealing with him, Smith not only has saved time, but has probably come nearer to getting what he wants than he would working by himself. Such middlemen as commission merchants and brokers are also almost purely creators of possession satisfaction—their job is almost solely to find a buyer. Creating possession satisfaction is the special function of all kinds of merchants.

But associated with the changing of possession in the case of merchants must usually be much of other sorts of changes. The retail merchant, for example, must keep on hand a large stock of goods in order to give his customers adequate selection as to fit, style, pattern, and quality of materials. The grocer must keep enough of a stock on hand so that he will surely have enough to supply his customers till his stock can be replenished. Not less important is the assembling of his stock of goods at a convenient point, and in many cases delivery of goods at residences.

The technique of creating possession satisfaction includes attracting or reaching customers, selecting goods to suit the individual customer, showing the goods, and perhaps a certain amount of persuading to buy. The processes involved are simple. The effort required is largely the physical effort of talking, together with such thinking and planning as must precede or accompany it. Little in the way of plant or equipment is needed—only show cases, display room, and perhaps conveyances for transporting customers, or going to them. The goods or services appreciate as they pass into the hands of those who have need of them—the better suited the buyer, the more satisfaction that has been created.

Middlemen and other creators of possession satisfaction are more frequently charged with being non-producers than any other class. This is because the satisfactions they create are not very tangible. There are many who can see that those bringing a commodity to them, or holding it for them, are rendering real benefits, who will not recognize the benefits involved in helping them get exactly what they want.

Advertising.—Closely associated with merchandising is advertising. Is advertising production or is it not? Does advertising make a contribution to the satisfaction of human wants? This is a question which has been debated at great length. There can be no question about that kind of advertising which gives people accurate information about commodities, or which tells them where they can buy commodities of

the sort they want. This is merely facilitating the possession of the commodities by those who want them. But advertising includes much besides this. It sometimes makes people want things that they did not want before—automobiles, radio sets, travel, etc. The window display type of advertising is especially effective in this way. It may also make us want some things in place of others. To a considerable extent, wants compete with each other. The satisfying of one want prevents the satisfying of another. If my family spends part of its means for a housemaid, it may not be able to afford an automobile. If we consume many Sunkist oranges, we will consume fewer Skookums apples. In many other cases, it merely causes us to buy one brand or make of an article in place of another—Camel cigarettes in place of Fatimas, or a Dodge automobile in place of a Buick. The new want stimulated may be of a sort which is ordinarily classified as desirable—such as a want for good music; or it may be the opposite of this. The new want which is substituted for an old one may be an improvement upon the old one—such as a want for comfortable housing in place of a want for sports and cheap theatricals; or a want for education in place of a want for the "excitements of youth"; or a want for vitamin-rich fruits and green vegetables in place of a want for cakes and confectionery. Or it may be the reverse of these. How much and what of all this is production?

Earlier in the chapter we decided that the hotel-keeper who makes up the menus is producing, because he is making a choice for us. Likewise is the housewife producing when she plans our meals. Does not advertising perform somewhat the same function? To be sure, the advertiser does not actually choose for us; but he assists us in making a choice. In the first place, he calls a possible choice to our attention—reminds us that here is a commodity or brand of a commodity which we must not overlook in making our selection. In the second place, he is likely to furnish us with information about his commodity or brand which will help us in making a decision. Not all choices, however, are what are called "rational." Many are the result of mere suggestion, of having some commodity brought to our attention at a moment when our so-called thinking processes are not focused on the matter of such a choice. Probably nearly all our choices are more or less influenced either by momentary suggestions of this kind, or by an accumulation of suggestions over a period. Advertisers fully realize the power of reiterated suggestion, and so play up the same catchword and the same ideas month after month and year after year. It makes no difference,

however, so far as present purposes are concerned, whether the advertising assists us in making a rational choice, or merely influences us in making a choice "unconsciously." By whichever way it happens, the advertising plays a part in the making of the choice. It would seem that in all these cases, therefore, the advertiser is producing. Indeed, it is hard to see how one could declare otherwise. If the necktie salesman in a department store who shows us his line is classified as producing, we can hardly escape classifying in the same way the department store's window dressers, and "ad" writers, and the newspapers and billboards that carry the advertisements.

Some of the choices which are influenced by advertising, however, are exceedingly inconsequential. It probably makes very little difference which make of good linen collar one wears, or which brand of oatmeal one eats, or bread or prunes or canned corn. Where such is the case, advertising is still production, but it is very little productive. There is probably a great deal of advertising which either plays a small part in influencing our choices, or else influences us in making choices which are of slight consequence. The productiveness of advertising, on this score, is proportional to the amount of assistance or influence it lends in making choices, and the importance of the decisions that are determined or influenced by it.

It is frequently said, however, that the mere creating of wants is not production; that production involves the satisfying of human wants, not the creating of them. How is this which we have just described different from the mere creating of wants? If we influence a person to want a certain article, we certainly have created a want for it. But almost always we have done more than this—we have in addition influenced him toward making a choice which will result in a greater satisfaction of wants than otherwise would have been the case. If we influence a housewife toward buying a Wilton rug instead of a Brussels rug, when she makes her purchase she will be the better satisfied for having spent her money for the Wilton rug, at least, for the time being. We have thus not merely created a want, we have contributed a greater degree of satisfaction of want. If she never purchases the Wilton rug, of course our productive effort will have gone for naught.

This leads us at once to the advertising which causes us to make wrong decisions—is this production? We shall merely say at this point that it will have to be classified as *production activity*, but not necessarily as *production*. There is much production activity in all the various lines of production which returns negative rather than

positive results. We will discuss this later in the chapter as *contra-production.*

There is also the question as to whether the advertising influences us to develop what are ordinarily classified as good or bad wants. It is customary in economic treatises to say that a want is a want, and it makes no difference, economically speaking, whether it is good or bad, that satisfying a want for intoxicants is just as much production as satisfying a want for meat and milk. There is a point of view, however, from which this does not appear to be the case—that of a period of time long enough for the individual to discover mistakes in his choices. This point of view will be considered later.

About as much advertising is directed to choices between different types of machines, or building materials, or supplies as to choices between goods for direct consumption. Such choosing contributes indirectly to the satisfaction of human wants, and hence is production.

We are now ready to state wherein advertising is production and wherein it is not. It is production when it tells us about different commodities and thus enables us to obtain the particular article which we want; when it tells us where we can buy the particular article we want; when it reminds us of articles which we should consider in spending our income; and when it helps or influences us in making choices, providing we are better satisfied at the time for having made such a choice. Much advertising effort, however, leads us to make relatively inconsequential choices, and hence is very little productive. Also much of it leads to wrong choices, and is therefore *contra-productive.*

Organization Building.—Most actual production is not carried on by single individuals acting as a unit, but by organizations of one kind or another. A factory is a common type of such organization. A factory organization comprises a factory building, a site, equipment, a large number of employees of various grades and classes, foremen, superintendents, a manager, officers, a "production" department, a sales department, an accounting department, etc. Such an organization may be looked upon as a machine; like a machine, it has many parts of different sizes, patterns and materials, each with its own function and each having a definite relationship to the others. One factory may be more productive than another because it has a better factory building, or better equipment; or not because these are better, but because they are better fitted to each other as to size, or type or quality. It may also be more productive merely because it has a better system of supervising or checking up the

work of its men; or a better system of keeping records and accounts; or a better piece work system; or a better plan of selecting salesmen, or training them; or more skillful workmen; or more loyal workmen; or merely because the officers and manager work well together.

These differences in productivity are especially conspicuous as between large producing organizations, such as railroads, mines, department stores, chain-store systems, wholesale houses, mail-order houses. Modern large-scale production therefore makes organization and system appear to be of paramount importance. But as a matter of fact they are of equal importance in small-scale production, such as carried on in our numerous small stores, banks, workshops, print-shops, and on our nearly seven millions of farms, and in our twenty-four millions of households—no, not of as great importance for any one store, or farm or household, but fully as important in the aggregate. The costs of operating individual stores vary as much as 10 or 15 cents per dollar of sales. The costs of operating different grain elevators vary as much as 7 cents per bushel of grain. These variations in cost arise largely because the individual units are not equally well organized. One store has too large a plant and too much equipment and is paying salaries altogether out of proportion to its volume of business. Or it is using wasteful methods of buying. Or it has poor systems for keeping check on its stock of goods. One farmer is planting too large or too small an acreage of cotton, is using too much or too little fertilizer, or hiring too much or too little labor, or is growing the wrong crops in combination with cotton.

The quality of an organization inheres in such things as the fitting together of its various parts, of its buildings, equipment and personnel, in the matter of the size or proportion of these parts, in their combination as to types and qualities, and in their physical arrangement; in the matter of the size of the plant and equipment as a whole in relation to volume of business; in the choice of location for the business in relation to sources of supply and markets; and in whatever pertains to the business as a whole in the way of physical records of transactions, operations, processes and the like. One of the most important phases of it is the selection of employees. Not only must capable men be brought together, but also men who will supplement and complement each other and work well together. It has been argued that all these things inhere in or are attached to the persons, plant and equipment that make up the producing organization; that actually they take the form of knowledge possessed by the persons

who make up the organization, and skill acquired by them, and of properties of the various items of plant and equipment; and such being the case, that all have been included in the various forms of service and commodity production above described. It is true that much of it answers such a description; but there is surely enough to warrant setting up organization building as a separate type of production. Anyway it is not intended that the various forms of production here presented will be completely exclusive of each other.

A splendid example of this in agriculture is the building up of a herd of live stock. When after years of effort, the breeder has developed a herd of recognized quality and type, he has created an organization that is worth far more than the sum of the value of his individual animals. The building up of a large department store is a task with a similar appeal to the constructive imagination, involving much the same type of organization values.

Now such productivity as has just been described does not come into existence by accident or by magic—it is attained as a result of human effort, not physical effort to any great extent, but mental effort. It is as surely an aid to further production as the productivity that becomes embodied in a machine. In the aggregate, a very large amount of human effort is devoted to the building up of organizations.

Such improvements add to the productivity not only of the organization, but of society and the nation. Organization improvements embodied in personnel are not subject to the same control as those embodied in machines and factories—the employees may leave after they have been trained and go to work for a competitor. There are some organization improvements, it is true, which are developed and used in a largely *acquisitive* way—that is, their advantages in production accrue mostly to their particular possessors. Take, for example, such things as secret processes, trade secrets, patents and copyrights, private mailing lists and the like. But these also make it possible for any organization to produce a larger product with less effort, and thus add to the total product of society. If some of them—secret processes, for example—were disseminated widely, they would aid much more in production than at present. But perhaps the special inducement of exclusive use is necessary to encourage progress in production. Our laws surely accept this opinion in the matter of patents and copyrights. Some of such improvements, such as accounting information and the like, would be of very little value to other organizations.

The building of organizations involves no processes not already

described. Most of it involves little or no material or equipment. The effort involved is largely mental rather than physical. The energy put forth by the producers of the organization improvements reappears in the form of new knowledge, or skills, or aptitudes, or attitudes, or points of view, on the part of the members of the organization and its employees, and new relationships between the members of the organization, and between parts of the physical plant, and the plant and the personnel and the plant and the outside world. The largest single aspect of it is the training of employees and breaking them into the organization. This is more important for superintendents, foremen and the like than for the skilled workers, and more important for the skilled workers than for the common workmen. The breaking in of the sales force is especially important. Next in importance is the development of structure, system, lines of authority and responsibility, and of methods and practices suited to the particular production and sales problems of the organization.

Goodwill-Building.—A special form of organization improvement is what is known as *goodwill.* Every organization which sells goods and services has a more or less satisfied body of customers or patrons. No one of these is under obligation to continue his patronage of the organization; but actually most of them will, because of having received satisfactory goods and services in the past, or simply as a matter of habit or convenience—most people find it easier to continue with the same merchant than to change to a new one. The same statements apply almost equally to particular brands of goods. By advertising or otherwise, a merchant or manufacturer can find new customers for his goods. If the goods are satisfactory, habit and convenience will do the rest. In some cases, large numbers of people are inclined toward brands or makes of goods that they have never used merely from seeing them advertised, or from hearing them favorably mentioned. This complex of opinion and attitudes and habits of people which predisposes them to buy of a particular merchant, or buy a particular brand or type of goods or services, is what is known as goodwill. Developing this goodwill is always one of the objectives of any business that has goods or services to sell. Next in importance to the actual selling of goods in the present, is getting people ready to buy them in the future. Hence vast sums are constantly being spent upon advertising and display, upon "educating consumption," upon replacing goods that do not give satisfaction, and upon hundreds of little supplementary services and conveniences to buyers.

Goodwill may also take the form of a good opinion among laboring men with respect to certain employers, enabling such employers to secure good workmen without difficulty, and to retain them.

The question in which we are here interested is whether goodwill building is a form of production. The answer to this question must be approached from two angles. First, does it make the organization more productive? Developing goodwill does not for the most part bring any new productivity into existence, as does making a new machine, but merely transfers something from one party to another. Most of the good opinion or disposition to purchase that becomes associated with one commodity, is merely taken from or kept from some other commodity. If the goodwill is as much of an aid to further production in the hands of one party as in the hands of another, nothing whatever is added to the productive equipment of society by transferring it. And no doubt this is frequently the case. There is a tendency, however, for those organizations to secure the most goodwill that can make the best use of it; and where the transfer is of this nature, new productivity has been created just as surely as when a machine or a factory building passes into the hands of those who can make it contribute more to the product. All that can truthfully be said against calling goodwill-building a type of production is that in more cases than for other types of production the productivity gained by one party is merely lost by another.

One difference between goodwill and the organization improvements discussed in the last section is that goodwill is probably always of value to another organization, whereas some organization improvements are not. Another difference is that some organization improvements are more productive if more widely disseminated, whereas goodwill can be of aid to production only as attached to particular organizations or products.

As already pointed out, the control which any organization exercises over some of its organization improvements is limited, since its employees are free to quit at any time; and this is also true in part of its goodwill. Nevertheless, the production of goodwill is one of the most important objectives of any organization selling its own product, and of considerable importance even if sales are made to jobbers or through brokers. The processes are essentially of the same type as those creating other forms of organization improvements. Little in the way of materials or equipment is required. The effort put forth in production reappears in the form of new information among consumers,

or new attitudes or habits or conventionalities or customs or traditions. The methods employed, however, are quite different, since the persons it is desired to affect are not constantly on hand, as in the case of employees, but must frequently be reached through the channels of publicity. Advertising in all its forms is a principal means for creating goodwill. Quality of goods and brands are other important means.

The other point of approach to goodwill-building as a form of production is that of its connection with advertising and choice of commodities and services. The opinions or predispositions of people with respect to certain commodities determine or influence our choices with respect to them. Building up goodwill is therefore from this point of view merely one way of assisting or influencing people in their choices. Since it is presumed that good opinions as to certain articles and predispositions to use them cannot be developed except on the basis of continued satisfaction with them, it generally happens that goodwill-building really does contribute appreciably to the amount of our satisfactions. Moreover, it facilitates our getting the kind and quality of article we want because goodwill is usually associated with branded standardized articles produced in large quantities and easily available.

VI. ACTIVITIES NOT PRODUCTIVE

It should be made clear, however, that not all human effort results in production. In the first place, some effort is merely play, and play is consumption and not production. In the second place, human effort may actually engender properties in goods which unfit them to satisfy human wants. Most goods are combinations of desirable and undesirable properties. The most palatable fruits frequently will not stand shipping. A clothing sample may have a beautiful weave, but poor wearing qualities. A process may bring out the desirable properties of raw materials, or it may destroy them. It may be productive, or it may be the opposite of productive. In fact, processes range all the way from highly productive, to non-productive, to highly destructive. To those activities which are destructive, which leave commodities with less power to satisfy wants than they had before, the term *contra-production* has already been applied. The cabinet-maker who makes a piece of furniture less desirable by using the wrong stain or finish is contra-productive while thus engaged; likewise the manufacturer who turns out a product which he cannot sell; the

salesman who tries unsuccessfully to induce you to buy an article which you do not want. It was pointed out earlier that much activity *intended* to be productive fails of its purpose. Since the effort and the resources which have gone into the attempt are wasted, the undertaking can only be called contra-productive.

There are also many services rendered to persons which are positively obnoxious to them. These are commonly referred to as *disservice.* Somehow or another, a vast amount of disservice to persons is rendered in the world of to-day. Much of this is unpreventable, growing out of the fact that it is frequently impossible to please one person without displeasing others. A vaudeville bill has to be made up so that there will be something to suit the tastes of all classes of comers.

It will also be pointed out by some that certain commodities may exist in such abundance—like wheat or fuel on our frontier at times—that nobody will pay anything for them; and that increasing the supply of such commodities cannot really be called production. This is indeed a far-fetched exception. Few things are produced which do not satisfy a want of sufficient importance that something will be paid for them.

It will be apparent that two sorts of activities have been discussed in this section; first, those activities, such as play, which are not intended to be productive, and which clearly cannot be classed as production; and second, those which were intended to be productive, but which due to mistakes or accidents or unforeseen occurrences, turned out to be contra-productive. These latter have the right at least to be called production activity, even if they are not productive. They will be so called in this treatise.

The Individual *vs.* the Social Point of View in Production.—The decision as to whether various types of activity are production or not, depends to a large extent upon the point of view from which one reasons. There are those who even say that safe-cracking is productive because it yields an income, albeit a precarious one, to the individuals engaged in it. At the other extreme are those who say that growing tobacco is not production because tobacco does not really benefit the individual or society. The first represents an extreme individualistic point of view; the latter an extreme social point of view. The point of view in this text is somewhere midway between these two extremes. As long as the want which is satisfied, either directly or indirectly, is an actual want of an individual at the time,

and does not rob someone else of a greater satisfaction, any activity contributing to its satisfaction is called production. The want may be one whose satisfaction will disappoint the individual, such as a little girl's want for her first pickle; but if it is a want, then anyone satisfying it is producing. The safe-cracker is not producing because he merely robs others of power to satisfy their wants.

The principal difficulty with applying this standard is that some activities satisfy wants that are very real for the time being; but whose satisfaction the individual regrets sometime subsequently—like a small boy's want for his first pipeful of tobacco. Most people spend their money for scores of things every week which they presently come to regret having purchased. Were the purveyors of these things producing? The position taken in this textbook is that they were producing, because the goods were wanted at the time the production process was executed. Looked at from a *long-time* point of view, however, obviously such activity is not production.

What, then, about the salesman who induces us to buy something which we had not thought of buying? If we are satisfied with our purchase when he leaves, then he is producing. If we are not, then he is not producing. Practically speaking, however, unless we are satisfied with our purchase for a considerable period, there has been very little production.

Elemental Properties.—It is also highly important to realize that not all the properties of things by virtue of which they satisfy human wants are created by man. Man is not responsible for the property of coal to produce heat; or the high tensile strength of native copper, or the property of water to freeze at 32° F., or for a beautiful sunset. In the last analysis, of course, all want-satisfying power really exists in nature in some form or other—all that man does is to convert the materials and forces of nature into useful forms; and man himself derives his energy from nature. But we are not interested here in the sources of human energy. For our purposes, man and nature are two separate agencies. The natural properties inherent in a mahogany table are more vital to it than any of the work done by man upon it; and the natural properties of water, coal and iron are of tremendous significance to humanity. But in the economic sense, as we shall discover later in our study of economics, they may not represent as great value as the human labor involved in extracting them, since many of the elemental properties have little or no value because of their abundance; for example, the elemental properties of sunshine and water.

Form or substance properties, it will be apparent, are in large part elemental. The manufacturer adds greatly to the want-satisfying power of his products, but nature's share is even greater. Nature contributed greatly to the want-satisfying power of the natural resources of the United States when she placed her coal and iron deposits so near together with water transportation between. A large part of the world's goods are produced near where they are wanted. A good part of this, however, is due to the fact that populations have developed where the commodities were or could be produced. On the other hand, the tropics could produce much more than they do and would if they were nearer to the dense populations of the earth. Nature likewise has added greatly to the want-satisfying power of her food supplies by arranging the periods of maturity for different parts of the earth in such a way that some crops, like wheat, for example, are ripening somewhere every month in the year; and in such a way that fresh natural-grown fruit and vegetables of one kind or another can be made available a good part of the year. This reduces the amount of storing necessary. Hence even the place and time properties of commodities are in some part elemental.

Also it is clear that producing is not creating commodities—it is creating properties in commodities which enable them to satisfy human wants. When a book is made, no new physical material is brought into existence. The paper was in existence, and the ink, and the cloth in the cover, before the book was made. All that the printer and binder did was to take these materials and assemble and arrange them in a certain way. Even the power which it took to run the printing press was in existence in the form of coal. The pulp from which the paper was made was in existence as wood. All that production did was to change the form and arrangement of these materials. The same thing is true of the making of a chair, or the milling of flour, or the baking of bread. To speak of production as creating commodities is therefore really a figure of speech.

One at once thinks of the possible connection between this process and the physical principle of conservation of energy, namely, that "the total energy of any material system can neither be increased or diminished by any action between the parts, though it may be transformed into any of the forms of energy" (Webster). The physical changes involved in carrying a stone are that of lifting it a few feet against the force of gravity, overcoming the inertia of the mass and starting it on its way, holding it suspended against the force of gravity

while it is being carried, and finally dropping the stone in its place on the new pile. Surely all of the energy put into producing these changes can be accounted for somewhere in the system after they have taken place. But this is not the whole consideration. One worker, failing to plan his work properly, may put forth half as much more energy than another—yet no additional want-satisfying power will result because of the additional energy. Or one may labor in such a way as to diffuse, or lose in friction or false motion, a good deal of energy. Or the stones may be re-piled in the wrong place, with the same result. In short, there is no necessary proportionality between the amount of effort put forth and the amount of want-satisfying power resulting. We shall learn later in our study of economics that there is a tendency for the two to be roughly proportional to each other; but it is only a tendency. Hence, we may conclude that although in a physical sense no energy is ever really lost, in an economic sense much is so applied as to create no new want-satisfying power; and on the other hand, much is so intelligently applied that a little causes a great increase in want-satisfying power.

Summary.—In the following table an attempt is made to summarize the foregoing discussion of types or forms of production. A different basis of classification is used in each of the three divisions of the table:

- I.
  - 1. Changes to persons
  - 2. Changes to commodities
  - 3. Changes in the relation of persons to commodities or services—changing possession
- II.
  - 1. Production
  - 2. Contra-production
- III.
  - 1. Final goods
    - 1. Durable
    - 2. Intermediate
    - 3. Non-durable
  - 2. Capital goods
    - 1. Goods in process
    - 2. Roundabout-production goods (machines, etc.)
  - 3. Personal service
    - 1.
      - 1. Producing satisfaction mostly immediately
      - 2. Producing satisfaction mostly later
    - 2.
      - 1. To others
      - 2. To one's self
  - 4. Organization
  - 5. Goodwill
    - 1. Of customers
    - 2. Of employees

The third classification is according to type of product resulting from the production process. The sub-classifications under these headings introduce some new distinctions. The durability of final goods ready for consumption is only a matter of degree, ranging from goods as non-durable as a serving of ice cream, to strawberries, to oriental rugs, to diamonds. The satisfaction from personal service may range from as momentary as that obtained from a vaudeville joke, to as permanent as that obtained from the extracting of an ulcerated tooth. Self-improvement would be classified as personal service to one's self of a permanent type. Organization can if desired be further classified as to whether inhering in persons or in things.

VII. CLASSIFICATION OF PRODUCTION ELEMENTS

Everywhere in the preceding discussion, reference has been made to the elements or factors which are associated in a production process. It is now time to make a systematic classification of them. Economists have usually referred to these as "production goods," or sometimes as "cost factors." If we call them production goods, we must recognize that one of the most important of these goods is man. "Cost factors" is perhaps a more nearly all-inclusive term, but it suggests the point-of-view of cost, for which we are hardly ready at this stage of the analysis. If we will learn to use it at this point with the understanding that its real significance will be explained later, no harm will be done. In this treatise, the two terms will be used more or less interchangeably.

It will be apparent from the foregoing discussion that in most production processes four elements are needed: the subject element, the thing worked upon; the active agent, the worker; the tools or machines and the like worked with; and the supplies used up. The following classification is based upon a more detailed consideration of the way in which these elements behave in the processes of production:

Man—Human effort.
Land and land betterments.
Land reconstructions—roads, bridges, tunnels, canals, ditches.
Land fixtures—railroads, fences, telegraph lines.
Buildings.
Raw materials—ore, natural timber, fish, game, water, etc.
Goods-in-process.
Supplies—fuel, feed, seeds, oil, paint, paper, twine, etc.

Equipment—tools, machines, street cars, etc.
Work stock—horses, mules, etc.
Breeding stock.
Growing stock.
"Productive" live stock—dairy cows, sheep, etc.
Growing crops.
Organization and goodwill.
Money.

Both buildings and equipment depreciate from their first use, but buildings have a fixed location whereas equipment is movable. Land "reconstructions" such as ditches, tunnels, bridges and roads, depreciate and have fixed location exactly like buildings. Land fixtures behave even more like buildings. Certain other changes to land, however, such as additions of fertilizer, removing stumps or stones, leveling, once they have been incorporated in the land, behave exactly like land itself. There is no significant difference between the behavior of a naturally level stretch of land and one which has been made level artificially; or between natural soil humus and that which has been put there by the use of manures. Land, it will appear presently, although it depreciates with use, does not in ordinary experience ever depreciate to the point where it cannot be restored again to former productivity; and land betterments behave as if they were the land itself—in fact, they are the land itself.

Raw materials appreciate with the first step in production and become goods-in-process, which in turn appreciate and pass into other and more advanced stages of goods-in-process, till they finally become final goods-in-hand for consumption. Appreciation is taking place all of the way, although in the case of perishable fruits, for example, accompanied by a depreciation that may more than offset the appreciation. Supplies, on the other hand, are used up in the process of production, either losing their original form completely, as in the case of fuel, or losing it sufficiently so as not to be suitable for further use, as in the case of paper or twine.

Growing live stock behaves in most respects like goods-in-process; but work stock, breeding stock and "productive" live stock behave like equipment—each act of production uses up some portion of them. All live stock, however, depreciates in an unusual way. In the first place, the organism recuperates almost completely after each act of production, so that the residue of actual final depreciation is always very small; and in the second place, until somewhere near the prime

of life is reached, this residue is more than offset by other compensating growth processes, so that it is commonly said that live stock appreciates at first and then depreciates. This statement is actually true, although it must be recognized that the appreciation is after all only a *net appreciation*, the result of a gain of one kind that more than offsets a loss of another kind. The expression "productive live stock" has come into use to describe live stock that yields a product, like milk, wool or eggs. The term is not a good one, however, and continues in use only for the want of a better.

Growing crops is still another form of goods-in-process, very much like growing live stock in most respects.

Money is put in a separate classification because mobility is its very essence. It is like equipment in its method of depreciation, that is, it starts in as new money and wears out from use.

Organization and goodwill are most peculiar of all in their behavior in the production process. Both are very irregular in their manner of appreciating and depreciation. They will be discussed in a later chapter.

The behavior of human beings in production is much like that of work stock in one respect, namely, in the manner of appreciating and depreciating. The essential difference between man and all other agents of production are his power to control his own behavior and his ability to determine his own productive powers.

The special characteristics of each of these classes of production elements will be considered in detail in later chapters.

In textbooks in economics, it is customary to group the foregoing list of production elements into three classes. Labor, or Human Effort, is made one classification, Land another, and all the rest are called Capital Goods. Land betterments and land reconstructions are usually classified with Capital Goods because they are products of past effort. Some writers do not attempt to separate Land and Capital Goods. Obviously such a classification is not of very much value for the purpose of a production economics analysis; but some use of it will be made in this book.

VIII. THE SCIENTIFIC BASIS OF PRODUCTION ECONOMICS

It will now be apparent that the science of production is a science of combination. The various types of production elements may be associated in any number of different combinations, and in any number of proportions in each combination. The elements themselves vary as to the size of the unit, as to "*quality*" or *grade*, as to *place*

available and *time* available, and as to *possession* availability. Each product has its special set of requirements, and the production elements must be suited to the particular product desired. A crop requiring a large amount of moisture cannot be grown on semi-arid land. The science of production must provide the basis for securing the right combination of the elements as to proportions, size, quality, time and place, all considered with reference to the particular type of product desired. The right combination is the one which secures the most economical utilization of all the elements. *To secure this combination is the goal of production economics.*

It has already been pointed out that economics does not concern itself specifically with the actual physical processes of production, with the technique of mixing concrete, or roasting coffee or feeding live stock, but instead with questions as to choice between different ways of using one's time and energy and resources in production. Some of the choices with which production economics concerns itself are the choice between different products, different kinds and amounts of raw materials or supplies to use in producing them, different kinds and amounts of labor and equipment to use. All choices involve two sorts of considerations, technical considerations based on physical or chemical differences, and economic considerations, based upon value or price differences. The final objective in an economic analysis of production is to choose and combine the products and production elements in terms of their values or prices. If this is to be done intelligently, however, there must be a clear understanding of the purely physical and chemical requirements and properties of the products and elements combined. It is not the province of the economist to discover these properties, but he is expected to understand them so far as they are known. If he does not, the whole economic analysis which is built upon them will be confused and misleading. In the pages which follow, the procedure will always be to state the physical relationships first and the value and price relationships afterwards.

The term physical as here used is really meant to include the psychological along with the other natural considerations. The relations of men to each other, to their employers, and to their tasks, are of first importance in any study of the science of combination in production. There is a growing realization of this on every hand. The principal difficulty with including such relations in an analysis such as here attempted is that psychology itself is hardly ready to furnish the data needed.

SUGGESTIONS FOR FURTHER READING

The most exhaustive of the available discussions of the nature of the production process are Eugen von Boehm-Bawerk's in Books I and II of his *Positive Theory of Capital* (Reprint 1923), and Karl Marx's in his *Capital.*

John Stuart Mill discusses production in Book I of his *Principles of Political Economy;* and F. W. Taussig in Book I, particularly Chapters 1, 2, 5 and 7, and Book V, Chapter 46, of his *Principles of Economics* (1921), and F. M. Taylor in Chapters IV and V of his *Principles of Economics* (1921).

For more recent discussions, see O. Fred Boucke's *Principles of Economics* (1925), particularly Chapters 10, 12 and 18, and Raymond T. Bye's *Principles of Economics* (1924), Chapters V and VI.

Stuart Chase's *Tragedy of Waste* contains a popular discussion of some phases of the problem.

Advertising as a form of production is discussed in Fred E. Clark's *Readings in Marketing* (1924), Chapter VI, in M. T. Copeland's *Principles of Merchandising* (1925), Chapter IX; and by A. C. Pigou in *Economics of Welfare* (1924), pp. 174–177. The supplement to Volume XV (1925), of the *American Economic Review* contains several papers on various phases of advertising.

PROBLEMS

1. Are the following production or consumption? Why?
   a. Riding to work on a street car.
   b. Carrying one's own golf bag.
   c. Pressing a suit of clothes.
   d. A physician's diagnosis.
   e. Shining your own shoes.
   f. Attending the university.
   g. Working on a boat smuggling liquor.
   h. A professional gambler playing cards.
   i. Saving for a vacation.
   j. Saving to buy a business.
   k. Duties of a dramatic critic.
   l. Selling fake oil stock.
2. Many people think that "laborers" are the only real producers. What reasoning would you use to show that this is not true.
3. J. S. Mill says that the labor of a teacher is productive because it increases the "ultimate" product, but that the labor of a mere entertainer is not. Is this statement correct? Give reasons for your answer.
4. If the following are productive, what do they produce?
   Chamber of Commerce.
   Insurance companies.
   Country clubs.
   City fire department.
   National guard.

Historical society.
Circus parade.

5. "Robinson Crusoe did not produce—he only consumed because he was only satisfying his own wants." Is this correct?
6. Give three examples of activity other than personal service where consumption and production are taking place simultaneously.
7. Select some commodity or manufactured product with which you are familiar and trace its production from its very beginning till it is in the hands of the final consumer. Show at each stage what changes (time, form, place, etc.) and what production processes are taking place.
8. Classify the activities of the following as commodity or service production:

a. Storage warehouse.	f. Street railway.
b. Soda fountain.	g. Electric power plant.
c. Coal mine.	h. Centralized heating plant.
d. Air mail system.	i. Watch factory.
e. Surgeon.	j. Broker.

9. What conditions or circumstances pertaining to goods or services are changed so as to increase their want-satisfying power by each of the activities involved in No. 8?
10. Show which phases of the production process are particularly important in the activities of each of the commodity production units listed in No. 8.
11. What production processes take place in a hotel? At a baseball game?
12. Describe some simple roundabout-production process.
13. Describe by example production in stages.
14. What are the essential differences between (a) final goods, (b) goods in process, and (c) roundabout-production goods? Which of these are capital?
15. Why in former times have many economists considered most personal service to be unproductive?
16. Show how personal service production may entail each of the four processes of production.
17. Make a list of ten advertisements and arrange them in order with the most productive at the top.
18. A public utilities commission in determining the value of a street railway system as a basis for fixing rates, included the item "going concern value" at more than a million dollars. What do they mean by "going concern value"? How is it productive?
19. State the reasons for and against calling the development of goodwill a form of production.
20. The text classifies organization building as productive. Do business men consider organization valuable when they come to buy or sell a business? Explain.
21. A story is told of a man who spent his evenings hauling water to a mud hole and his days pulling tourist cars out of the mud. Was he producing?

22. Many people have spent a lot of time trying to invent perpetual motion machines. Were they producing? Illustrate and give reasoning.
23. Is the student who copies his work from others producing?
24. Is the salesman productive who calls at your house and sells you a small article for 50 cents which you see the next day in the 10-cent store?
25. Of those activities in Problem No. 1 which are production, which are commodity production, and which are service production? Why? Are any of these production from the individual point of view but not from the social point of view?
26. John Stuart Mill said that man's part in production consists merely in moving materials so that natural forces can work upon them and so yield the result desired. Comment upon the truth of this statement.
27. List an example other than those already given for each final subdivision of the classifications of types of production given in the text under the summary of production.
28. Explain the meaning of the statement "The science of production is a science of combination."

CHAPTER III

THE FIELDS OF PRODUCTION

The purpose of this chapter is to give the student some idea of the manifold forms which production takes, and of the relative importance of the various fields of production both in the United States and elsewhere, but especially in the United States.

I. CLASSIFICATION

The United States Census Classification of 1920 has the following classification of industries and service groups:[1]

Agriculture, Forestry and Animal Husbandry
Extraction of Minerals
Manufacturing and Mechanical Industries
Transportation
Trade
Public Service (not elsewhere classified)
Professional Service
Domestic and Personal Service
Clerical Occupations

The last classification, Clerical Occupations, is not coördinate with the other eight—it cuts across them and includes stenographers, clerks, bookkeepers, and agents employed by most of the other eight. The reason for including the ninth group is that the purpose of the census classification is not really to provide an analysis of industries and service groups, but rather of occupations. The exact statement of the Bureau of the Census on this point is as follows:

"After careful study of the classifications in use in a number of the principal nations, it was decided that the proper basis for a classification of occupations is the worker and his work, and, hence, that occupations should be classified with respect to the kind of work done or service rendered rather than according to the article made or worked upon, or the place where the work was done. Therefore, it was thought that the best form of classifica-

[1] Attention is here called to the double use of the term *Industry* which is developing. In its broad use it includes all the major fields of production except the service fields; in its narrow use, only manufacturing and mechanical production. Thus we speak of industry as distinguished from trade and transportation and from agriculture. In this chapter the term is used in its broad sense.

tion for the United States would be an occupational classification with an industrial framework. Such a classification, it was believed, would give the most vivid picture of the occupational position of each and every worker, and would show the specific services rendered, work done, or processes performed by each worker.

"In the development of this new classification, each important industry, or service group,[1] was taken as a separate unit, and each of the specific occupations followed by the workers in it was listed thereunder, insofar as such occupation was definitely returned by the enumerators and was of sufficient importance to justify its separate presentation. Also, in the new classification, the number of main classes or general divisions of occupations was increased from five to eight, with an additional group for clerical occupations." [2]

The industrial classification is thus introduced only to give a general framework.

According to the census, there were 41,614,248 persons 10 years of age and over "gainfully employed" in the United States on January 1, 1920. This is 39.4 per cent of the total population, and 50.3 per cent of the population 10 years and over. The term "gainfully employed" has a special definition—it does not include women and children doing housework in their own homes, nor did it include in 1920 the boys and girls working at home "at general household work, or chores, or at other odd times on other work." Thus the 41,614,248 persons reported as gainfully employed includes only 8,549,511 females. Only 21.1 per cent of females in the United States 10 years of age and over are reported as gainfully employed, as contrasted with 78.8 per cent of the males.

Table I shows that the Manufacturing and Mechanical Industries employ the most workers, Agriculture coming second and Trade third. Agriculture here includes lumbering and fishing. Trade and Transportation together employ over one-sixth of all gainfully employed. The figure for Public Service is low because it does not include a large number included in other classifications, especially under Clerical.

[1] Public service, professional service, and domestic and personal service.

[2] Volume IV, *Fourteenth Census of the United States*, p. 10. The last statement refers to the fact that previous to 1910 all workers were put in five classes in place of nine, these five being as follows: Agricultural Pursuits, Professional Service, Domestic and Personal Service, Trade and Transportation, Manufacturing and Mechanical Pursuits. Under this classification, Clerical Occupations was included with Trade and Transportation, Extraction of Minerals was included with Manufacturing and Mechanical Pursuits, and Public Service was included with all the others, most of it coming under Professional Service and Domestic and Personal Service.

TABLE I. PERSONS 10 YEARS OLD AND OVER GAINFULLY EMPLOYED IN THE UNITED STATES IN 1920—BY OCCUPATIONS [1]

OCCUPATIONS	NUMBERS (000'S OMITTED)			PER CENT DISTRIBUTION		
	Males	*Females*	*Both*	*Males*	*Females*	*Both*
Agriculture	9,869	1,084	10,953	29.8	12.7	26.3
Mining	1,087	2	1,090	3.3	....	2.6
Manufacturing and Mechanical	10,888	1,930	12,818	32.9	22.6	30.8
Transportation	2,851	213	3,064	8.6	2.5	7.4
Trade	3,575	668	4,243	10.8	7.8	10.2
Public Service	749	22	771	2.3	0.3	1.9
Professional Service	1,127	1,016	2,144	3.4	11.9	5.2
Domestic, Personal Service	1,218	2,187	3,405	3.7	25.6	8.2
Clerical	1,700	1,426	3,126	5.1	16.7	7.5
Total	33,064	8,550	41,614	100.0	100.0	100.0

For several reasons, however, the classification used by the Census Bureau is not well suited to the needs of this treatise. In the first place, it is based upon occupations and not upon forms of production. In the second place, it largely leaves out of account one important form of production, namely, household production. The classification that will be followed in these pages is as follows:

Primary Production
- Extractive
  - Mining
  - Lumbering
  - Fishing
  - Hunting
  - Waterpower utilization
- Genetic
  - Agriculture
  - Forestry
  - Fish culture

Manufacturing and Mechanical
Transportation and Communication
Storage
Merchandising—Trade
Household Production
Professional Service
Other Personal Service
Public Service (not elsewhere classified)

[1] Vol. IV, *1920 Census*, p. 34.

The first thing that will be noted about this classification is that it takes up commodity production in logical order, starting in with the farm, the mine and the factory, and ending with the household. Service production, except what is included under Transportation and Communication, is in the four groups at the end of the list. Besides the service included in household production is that rendered by doctors, lawyers, teachers, actors and the like, classified as professional service; then that rendered by barbers, bootblacks, launderers, bell boys, and the like, here classified as Other Personal Service. The classification "Public Service (not otherwise classified)" is really upon another basis than the others. A considerable proportion of those on the public pay roll are engaged in primary production, or transportation, or in rendering professional or other personal service; but policemen, firemen, soldiers and inspectors cannot be so classified.

It will also be discovered presently that the foregoing is a classification in terms of producing institutions, that is, of the actual business and other institutions in which people are associated in their production operations. A farm is such an institution; so is a factory, a store, a household, a hotel, a university or a government.

In the pages following, each of these forms of production will be outlined in more detail and the census data will be introduced wherever possible.

II. ANALYSIS BY FIELDS OF PRODUCTION

1. *The Extractive Industries*

The five industries listed as extractive do not complete the list. In this category belong such production activities as gathering rubber, turpentine, wild fruits, nuts, honey, spices, wild rice, roots and herbs. The *extractive industries are those whose raw materials*—the materials worked upon—*exist in* nature. The production process consists of taking raw materials provided by nature, such as ore in a mine, trees in a forest, fish in the sea, or water in a stream, and working upon them either with the bare hands or with tools, machines and other equipment, using such supplies as may be necessary, and turning out a product either ready for final consumption or for use in a subsequent manufacturing stage.

TABLE II. INCOMES OF PRINCIPAL INDUSTRIES OF THE UNITED STATES, 1918[1]

	Amount in Millions	*Per Cent Distribution*
Agriculture	$12,682	21.9
Mining	2,013	3.5
Manufacturing	16,018	27.6
Construction	1,280	2.2
Other hand trades	1,704	2.9
Transportation	5,232	9.1
Banking	767	1.3
Unclassified	15,318	26.4
Government	2,961 [2]	5.1
	57,983	100.0

Mining.—The most important of the extractive industries is mining. In number of persons engaged, however, the mineral industry, as indicated in Table I, represents only 2.6 per cent of the total for all fields of production reported. The value of all mineral products in 1920 was $3,158,000,000; but some of this represents materials of other industries, principally fuel, power, building materials, equipment, dynamite, etc. which are used as supplies in mining and hence cannot be counted as net income to the industry. If the full value of product of each industry is counted, then the value of the supplies and partly finished goods turned out as the product of one industry will be counted over again in the value of the product of the industry making use of them. Table II eliminates these duplications by subtracting from the value of products of any industry the cost of all raw materials and supplies that have already been counted as products of industries of earlier stages in the production process. On this basis, the 1918 income of all mines in the United States was $2,013,000,000. This is the return to the mines, quarries and oil wells themselves and to all owners and employees. It is 3.5 per cent of the total net income of all industries.

[1] Data from *Income in the United States* by King, Mitchell, Macaulay and Knauth of the National Bureau of Economic Research. Later studies by the same Bureau give incomes for 1919, 1920, and 1921. The 1918 figures are abnormal because of war influence, but the later figures are even more abnormal, especially those for 1921. For example, the agricultural income reported for 1921 is only about 11 per cent of the total, and the manufacturing income only about 23 per cent of the total.

[2] Not including incomes of soldiers, sailors and marines.

The 1920 census reports 14,417 mines and quarries in the United States, and 257,673 petroleum and natural gas wells. Of 1,090,000 persons engaged in the industry, 34,000 were proprietors, officers and managers, 37,000 were other salaried employees, and 987,000 were wage-earners. In 1919, the coal mines employed 70.0 per cent of all the labor of the industry, and produced 47.8 per cent of the value of product. Petroleum and natural gas ranked second in importance, although employing 9.5 per cent of the labor and producing only 29.5 per cent of the value of product. In value of product, the other mineral products ranked as follows: iron, copper, lead and zinc, gold and silver, limestone, granite, sulphur, sandstone, etc. Only 45,000 wage-earners were employed in quarries. As time goes on, the tendency is for the so-called basic products, such as iron, cement and building stone, to be relatively more important, and for rarer products, such as gold and silver, to be relatively less important, in the production economy of the world.

Lumbering.—It is difficult to say where the extractive industry *lumbering* ends and the manufacturing of lumber products starts. In Table V, which follows a conventional classification, "lumber" and "its remanufactures" are combined in one item, and a value in 1919 of $3,070,073,000 is estimated for the product of both. The *Yearbook* of the United States Department of Agriculture places the value of lumber products for the same year at $1,298,899,000.[1] It can be assumed that this latter figure indicates roughly the value of the lumber as it leaves the sawmills. The rest of the three billion dollars represents value added by remanufacture and the transportation and merchandising incident thereto.

The annual output of the sawmills of the United States in 1920 was 33,799,000,000 board feet. This represents a decline of over ten billion board feet since 1909, the high point in production. The sawed lumber is only 36.8 per cent of our total timber cut. In comparison, 42.4 per cent is used as fuel, and 20.8 per cent as pulp wood, fencing, mine timbers and other forest products. The United States is cutting its timber at the rate of nearly 25 billion cubic feet per year. The original forest area of the United States has been estimated at 822 million acres. Of the 1,903,000,000 acres of land in the United States, only 465,000,000, or 23 per cent, were classified in 1920 as "forest, cut-over, and burnt-over land." About 168,000,000 acres of this were in farms and used as wooded pasture or as woodlot, and 297,000,000 acres were

[1] *1922 Yearbook*, p. 930.

in forest. Less than one-third of these 465,000,000 acres was classified as virgin timber, and 53 per cent as burnt-over or cut-over, and 17 per cent as lying idle and devoid of timber. The original forest stand has been estimated at 5200 billion board feet of merchantable timber, and the remaining stand at 2215 billion board feet.[1]

Of the persons gainfully employed in industry in the United States in 1920, 8410 were reported as owners or managers of logging camps, 205,315 as lumbermen, raftsmen and wood choppers, and 3653 as forest rangers and timber cruisers. These are included with agriculture in Table I. Persons employed in sawmills are counted in with manufacturing. "Lumber and its remanufactures" employed 839,000 in 1920.[2] How many of these are employed in sawmills sawing logs cannot be determined. The United States Forest Service estimates that one person is employed in lumbering for every 60,000 board feet of timber harvested. On this basis, our lumbering industry (not including timber used as fuel, etc.), would employ about 630,000 men. This would be 400,000 more than those reported by the census as engaged in logging proper.

Table II includes income from the lumbering industry in the "unclassed" item. The 1920 census reports the value of timber products sold from farms as $395,000,000, or $61 per farm. Some of this is for saw-logs.

Fishing.—The United States Bureau of Fisheries reports a yearly average of 6001 vessels engaged in the fishing industry, 187,800 persons employed, and a value of product of $111,000,000, these data representing mostly the years 1915 to 1922. Only 53,000 persons, however, reported fishing as their occupation for the 1920 census. The apparent discrepancy is probably due to the fact that many persons work at fishing irregularly. Oyster and salmon fishing, the two most important branches of the industry, are both very seasonal in their need for labor. Over half of the fish are canned.

In general, fisheries tend to become relatively more important as a country develops and population increases. They are more important in Europe than in the United States.

Hunting.—Among primitive peoples, or in a new country, hunting plays a prominent part as a means of livelihood; in an older civilization, it is principally a sport. Economically, furs are the most important product of the hunting industry. The 1707 fur-goods establishments

[1] *Ibid.*, p. 916, 83–180.
[2] See Table V. Paper mill employees are not included.

in the United States in 1921 expended $84,000,000 for raw materials, mostly furs, and sold products worth $139,000,000. Some of these furs were from domesticated animals.

In many older countries, especially in Europe, hunting is combined to advantage with forestry.

Water-Power Utilization.—No data are available indicating the number of persons engaged in water-power industry, or the value of the product. The stationary power produced in the United States in 1920 was 49,000,000 horse power. Only 9,500,000 horse power of this was obtained from water-power; but it is estimated that 19,000,000 more horse power can be obtained without difficulty, and that if means can be devised for storing up energy produced at high water, at least 25,000,000 more horse power could easily be produced. Canada has 17,000,000 of undeveloped horse power, not counting upon high-water possibilities; Europe, 36,000,000; Asia, 70,000,000 and Africa, 190,000,000. Both in Europe and in the United States, water-power development is going on rapidly. Electrical energy is now being transmitted 300 to 400 miles economically. The United States has 1500 miles of railway electrified; and Switzerland is planning upon having one-third of its railways electrified by the end of 1926.

2. *The Genetic Industries*

The genetic industries are those which *grow* their product. In the extractive industries, man takes the raw materials as they exist in nature and improves them and makes them appreciate; in the genetic industries, man uses the materials of nature much in the manner of supplies to assist him in the growing of a plant or raising of an animal. The material worked upon, the subject element, in the genetic industries, is the plant or the animal. The distinction between the extractive and the genetic industries is very clear in the case of lumbering and foresting. As long as the process involves merely harvesting a natural supply of trees, the industry is extractive; but when forest management begins and trees are grown more or less artificially, then the industry is genetic. The same distinction applies to fishing and fish culture.

Agriculture:—Agriculture is frequently referred to these days as an extractive industry. What difference is there, it is asked, between mining the plant food out of the soil, and mining coal and ore? So far as certain economic effects of it are concerned, there may be no great difference; but the production process is quite different—and it is from this angle

that we are viewing it at present. In the one case, the substance of nature is removed bodily from the earth, changed somewhat in form or condition, and passed on as a raw material or supply for some other industry. Even the water power is still power when it is turned out from the dynamo. In the case of agriculture, the soil loses its superficial identity completely in the product, whether the product be a plant or an animal. To be sure, some of the minerals of the soil can by chemical analysis be located in the fibers of the plant or tissues of the animal; but they are so changed in their associations as to be to all effects different substances. Furthermore, most of the substances of plants and animals represent complete chemical recombinations. The starch, for example, which is so important a part of every seed or tuber or root, has been completely synthesized by the plant. In the case of the ores, the materials of nature appreciate in the production process; in the case of the plants, the materials of nature lose their form.

The extractive industries are also sometimes defined as those which derive their raw materials directly from nature. This is a correct statement, but it hardly serves to distinguish them from the genetic industries. The raising of live stock may easily be looked upon as one step removed from the actual extracting of plant food from the soil; but not the growing of crops.

Speaking of that type of agriculture which too freely exploits the natural resources of the soil, Professor Carver writes as follows:[1]

> "Agriculture, however, is sometimes carried on in such a slip-shod manner as scarcely to deserve to be classed as a genetic industry. When farmers make no effort to preserve the fertility of their soil, but exhaust it by wasteful methods of tillage and by reckless over-cropping, and then move on to new and unexhausted areas, their business is sometimes called mining the soil. A genuinely genetic type of agriculture can endure and even improve for indefinite periods of time on the same soil; that is, it not only preserves but improves the fertility of the soil, generation after generation, for hundreds and thousands of years. It thus makes possible a stable, an enduring, and an expanding civilization such as could not be supported exclusively by any of the extractive industries."

Table I shows that 26.3 per cent of all persons gainfully employed in the United States in 1920 were in agriculture; and according to Table II, they received 21.9 per cent of the national income.[2] The

[1] *Principles of Political Economy*, p. 208.
[2] The average for the ten years from 1909 to 1918 was less than 20 per cent.

$12,682,000,000 of income given in the table was obtained by subtracting $1,032,000,000 for purchases from other industries, including such items as fertilizers, implements, automobiles for business use, insurance, interest paid to banks on loans, etc., from a gross income of $13,714,000,000. The $12,682,000,000 is thus the return to agriculture for land and labor, both hired labor and the labor of the farmer and his family.

TABLE III. SOURCES OF THE AGRICULTURAL INCOME OF THE UNITED STATES, 1918 [1]

Sources of income	*Amount in millions*
Crops not fed to live stock or used as seed	$ 7,119 [2]
Live stock sold or slaughtered at home	3,531
Dairy products sold	1,041
Dairy products consumed at home	541
Poultry sold or consumed at home	317
Eggs sold or consumed at home	512
Wool and mohair	140
Honey and wax	12
Increase in live stock inventory	96
Land improvements	405
Total	$13,714

[2] Total value of crops	$13,558,000,000	
Value of crops fed to live stock		$5,989,000,000
Value of seeds and plants used		450,000,000
Net value of crops	$ 7,119,000,000	

It will give us a clearer idea of the agricultural industry if we see of what this agricultural income is composed. Table III shows that in 1918 one-half of it, 52 per cent to be exact, was from crops directly, 3 per cent from improvements on land, and the remaining 45 per cent from live stock and live-stock products.

Of the 10,953,000 persons gainfully employed in agriculture, forestry and fishing in January, 1920, only 234,000 were reported for forestry, and only 53,000 for fisheries, which leaves 10,666,000 for agriculture alone. Of this number 6,464,000 were reported as farmers (or foremen) and 4,179,000 as farm laborers. This means an average of 0.65 of a laborer for each farmer. Of these 4,179,000 farm laborers, 1,850,000, or 44 per cent, were other members of the farm families working at home, one-third of whom were females. Also 37 per cent

[1] Data from *The National Income of the United States*, by W. I. King and others.

of them were 15 years of age or under. Of those reported as farmers, only 277,000, or 4 per cent, were women. But of those reported as farm laborers, 802,000 or 19 per cent were women or female children. Ten per cent of all gainfully employed in agriculture were females, and 6.2 per cent were 15 years of age or under.

Forestry.—In the United States, the artificial growing of trees is in its infancy. The Federal Government at present owns 89,000,000 acres of forest land; the States, 8,700,000 acres; and municipalities, 450,000 acres. The national forests include in addition about 60,000,000 of other land mostly not suited for forestation. On most of the government-owned lands, some degree of forest management is being practiced. In particular, cutting is carefully regulated, and fire protection is more or less organized. The federal government is planting only about 7,500 acres yearly. The states and municipalities are also planting another 7,500 acres yearly.

Several types of private agencies are also practicing forest management on a small scale, particularly large timberland owners, railroads, pulp companies and the like. All private agencies combined are now planting at the rate of about 20,000 acres per year.

Many European countries have developed forest culture to a high degree upon the public lands, and also to a considerable extent on private lands. They were forced to do this when their natural timber supply became exhausted. The annual per capita consumption of timber for all purposes in the United States is 212 cubic feet; in France and Germany 27 cubic feet.[1] We are still drawing upon our natural supply. Long before our timber supply reaches the degree of scarcity prevailing in most of Europe, we will be practicing scientific forest management over hundreds of million acres.

Fish Culture.—The federal government and many of the state governments of the United States have been giving attention for some time to the artificial propagation of fish, and the manner and time of catching fish is carefully regulated nearly everywhere. The United States Bureau of Fisheries in 1922 distributed over four billion of minnows for stocking rivers and lakes. Also many states have fish hatcheries.

3. Manufacturing and Mechanical Industries

The classification Manufacturing and Mechanical Industries used by the Census includes a vast assortment of industries, ranging from

[1] *1923 Yearbook*, U. S. Department of Agriculture, p. 483.

baking and blacksmithing at the beginning of the list, through clothing, glass, jewelry, iron, lumber, paint, and paper, to shoe and tinware manufacturing at the other end of the list. Dr. King in his analysis of incomes in the United States was able to separate them into three groups, Factory Work, Construction, and the Hand Trades.[1] The principal hand trades other than construction are as follows: custom tailoring, millinery and custom dressmaking, dyeing and cleaning, laundering, automobile repairing, blacksmithing, shoe repairing, custom grist milling, custom saw milling. The total net income from all these hand trades, according to Table II, was only $1,704,000,000 or 2.9 per cent of the national income. However, 276,000 establishments or entrepreneurs were represented in 1918, and in 1920 six hand trades alone—dressmaking, tailoring, blacksmithing, shoe repairing, millinery and jewelry and watch repairing, ranked in order of importance—employed over 800,000 people. Automobile repairing probably employs more than any of these six.

Construction, according to Table II, represented 2.2 per cent of the national income in 1918; and the 1920 census lists the following numbers of workers:

Carpenters	892,194
Painters, glaziers and varnishers	250,113
Electricians	225,529
Plumbers and gas and steam fitters	214,109
Masons	122,798
Plasterers	38,653
Cement finishers	38,255
Structural iron workers	18,836
Roofers and slaters	11,628
Contractors	90,109
Total	1,899,108

A considerable number of these, however, especially carpenters, painters, plumbers, and electricians, are employed in factories. This leaves close to ten million workers for the factory industries, credited by Dr. King with 27.5 per cent of the national income in 1918.

Taking manufacturing and mechanical pursuits as a whole, including the factory, construction and other hand-trade industries, 15 per cent of the workers were females in 1920, and only 1.4 per cent of the workers were 15 years of age or under. The comparable figures for agriculture are 10 per cent and 6.2 per cent. But a fifth of the women are in the hand trades, in dressmaking and millinery especially.

[1] *Income in the United States*, King, Mitchell, Macaulay and Knauth.

Of those employed in the factory industries, over half were employed in textile plants.

The census of manufacture is taken more or less separately from the rest of the census, the law providing that the canvass "shall be confined to manufacturing establishments conducted under what is known as the factory system, exclusive of the so-called neighborhood, household and hand industries." This means that construction and other hand trades are excluded.[1] The 1920 census of manufactures distinguishes 358 industries and publishes separate statistics for 306 of these. In Table IV are listed the first twenty of these in value of products, and also their rank according to value added by manufacture and average number of wage-earners employed. It will be noted that Slaughtering and Meat-packing ranks first in value of product, but only twelfth in value added by manufacture and fourteenth in average number of wage-earners employed. In value added by manufacture, Foundry and Machine-shop products rank first, and not included in this classification are machine tools, structural iron work, locomotives, hardware, and many classes of iron and steel products. As a matter of fact, a detailed classification such as that given in the census is misleading, unless taken whole, because it separates many industries grouped together in the common mind. Thus Men's Clothing as given does not include Shirts or Men's Furnishing Goods; and Automobiles does not include Automobile Bodies and Parts, which ranks twenty-fifth in value of product, and twentieth in value added by manufacture.

[1] Vol. VIII, p. 9.

TABLE IV. FIRST TWENTY MANUFACTURING INDUSTRIES IN VALUE OF PRODUCTS, 1920[1]

Industry	*Number of establishments*	*Rank in value of products*	*Rank in value added by manufacturing*	*Rank in number of wage-earners*
Slaughtering and meat packing....	1,304	1	12	14
Iron and steel, steel works and rolling mills....................	500	2	2	5
Automobiles....................	315	3	6	9
Foundry and machine-shop products........................	10,934	4	1	2
Cotton goods..................	1,288	5	4	4
Flour mill and gristmill products ..	10,708	6	28	41
Petroleum, refining.............	320	7	19	32
Shipbuilding, steel..............	162	8	5	6
Lumber and timber products.....	26,119	9	3	3
Cars and general shop construction and repairs by steam-railroad companies..................	1,744	10	7	1
Clothing, women's..............	7,711	11	11	13
Clothing, men's................	5,258	12	10	10
Boots and shoes, not including rubber boots and shoes...........	1,449	13	14	8
Bread and other bakery products..	25,095	14	15	15
Woolen and worsted goods.......	852	15	17	12
Electrical machinery, apparatus and supplies.................	1,404	16	9	7
Rubber tires, tubes, and rubber goods, not elsewhere specified....	437	17	13	22
Leather, tanned, curried and finished.......................	680	18	26	30
Printing and publishing, newspapers and periodicals...........	17,362	29	8	21
Iron and steel, blast furnaces.....	195	20	34	47

[1] *Fourteenth Census*, Vol. VIII, p. 16.

TABLE V. CLASSIFICATION OF MANUFACTURING INDUSTRIES OF THE UNITED STATES, WITH PRINCIPAL STATISTICS FOR 1919[1]

Groups of industries	*Number of establishments*	*Wage-earners (average number)*	*Capital ($1,000)*	*Wages ($1,000)*	*Cost of material ($1,000)*	*Value of product ($1,000)*	*Value added by manufacture ($1,000)*	*Primary horse power*
Food and kindred products.	61,312	684,672	4,635,150	722,540	10,111,547	12,438,891	2,327,344	2,571,257
Textiles and their products.	28,552	1,611,309	6,096,161	1,482,327	5,382,079	9,216,103	3,834,024	3,247,090
Iron, steel, and their products.	20,120	1,585,712	8,711,843	2,193,203	4,815,885	9,403,634	4,587,749	8,082,692
Lumber and its remanufactures........	39,955	839,008	2,590,046	847,032	1,359,999	3,070,073	1,710,074	3,417,941
Leather and its finished products.........	6,397	349,362	1,554,502	363,453	1,713,807	2,610,231	896,423	398,130
Paper and printing..........	36,403	509,875	2,423,400	564,510	1,306,718	3,012,584	1,705,866	2,351,224
Liquors and beverages.......	6,354	55,442	781,572	66,140	222,776	603,895	381,119	415,361
Chemicals and allied products	12,224	427,008	5,617,738	493,774	3,747,675	5,610,299	1,862,624	2,043,525
Stone, clay and glass products.	12,529	298,559	1,262,212	328,559	408,571	1,085,529	676,958	1,569,719
Metal and metal products other than iron and steel.........	10,667	339,469	1,796,669	394,628	1,910,035	2,760,294	850,259	988,688
Tobacco manufactures......	10,291	157,097	604,840	123,988	483,568	1,012,933	529,365	43,397
Vehicles for land transportation.........	21,152	495,939	2,423,239	689,475	2,498,226	4,058,912	1,560,686	880,496
Railroad repair shops........	2,368	515,709	776,844	726,690	547,829	1,354,446	806,617	648,345
Miscellaneous industries....	21,781	1,227,111	5,295,377	1,537,110	2,867,256	6,180,256	3,312,589	2,831,252
All Industries 1919........	290,105	9,096,372	44,569,594	10,533,400	37,376,380	62,418,079	25,041,698	29,507,117
All Industries 1904.........	216,180	5,468,383	12,675,581	2,610,445	8,500,208	14,793,903	6,293,659	13,487,707

Table V groups these 306 industries into fourteen classes. Thus classified, the group Iron and Steel and their Products ranks first in value added by manufacture, capital invested, wages paid, and primary horse power; the group Textiles and their Products ranks first in number of wage-earners; and the group Food and Kindred Products ranks first in cost of material, value of product and number of establishments. These three groups represent over half of the total value of manufactured products, and two-fifths of the value added by manufacture.

Summary: Primary Production.—In this textbook, the extractive and genetic industries, and the manufacturing and mechanical indus-

[1] *Statistical Abstract*, 1922, pp. 201–202.

tries, are combined into one larger group called the Primary Industries. Primary production is defined as production which turns out finished or partly finished goods ready for the market, except that they must be transported, stored and merchandised by some other agency before they reach the hands of those who are to make use of them. Primary production begins with the raw materials of nature, adds labor and other materials, and ends with a product ready to be sold and transported into final use—it may be used in direct consumption, or it may be used in other manufacturing processes. Thus production of tools, machinery, and manufacturer's supplies like chemicals, paints and oils, etc., is primary production the same as production of foods, clothing, and furniture. Following is a more detailed outline of what is included under primary production:

A. Production for the market directly, *e. g.*, clothing, furniture machines, crops, etc.

B. Production for use in further production on the same farm or in the same mine or factory, *e. g.*, feed for live stock, power to operate machinery, chemicals to use in other processes, timbers to use as mine supports, etc.

C. Production consisting of the utilization of these other products on the same farm, or in the same mine or factory, *e. g.*, the feeding of live stock, the sawing of logs into lumber, the canning of fish, the smelting of ore, the making of by-products.

D. Production for direct home consumption, *e. g.*, potatoes for the family, clothes for the tailor's own family.

Primary production, it is apparent, is mostly form production. But there may be almost any amount of moving of goods about or storage of goods within the establishment itself. In the factory, the raw materials have to be moved about and stored, and also the finished goods. In the mine, the ore has to be trammed to the shaft and hoisted to the surface. On the farm, the crops have to be hauled to the barn and stored for considerable periods. It might seem logical to include this transportation within factories and mines and upon farms under the next form of production in the outline, namely, Transportation. This, however, would lead into all sorts of difficulties. The classification which is made here is not on the basis of changes produced, but on the basis of *producing units*. The producing unit in primary production is a factory, a mine, or a farm, or a logging camp. Whatever goes on within these units, or is done by them, is part of primary production. Even the hauling of produce from the

farm to the local market is part of primary production, because it is ordinarily done as part of the regular farm work. If, however, a special transportation agency were set up which made it its business to haul farm produce to market, then hauling would no longer be considered a part of primary production.

According to Table I, about 60 per cent of all persons gainfully employed are engaged in the primary industries; and according to Table II, about the same percentage of the total income is obtained by them.

It would be interesting to compare the important primary industries as to value added by manufacture, that is, the amount by which the raw materials and supplies used are increased in value by the manufacturing process. Such a figure includes principally the value of labor and management added, and the value of the contribution to the product of the buildings and equipment used. Although this term can be applied literally only to manufacturing, it can be applied in an analogous sense to agriculture, mining and the other extractive and genetic industries. Unfortunately not all the data needed for such a comparison are available. For example, the data are not available for the cost of all the materials used in agriculture. A figure that is comparable can be constructed, however, if the cost of the supplies used in manufacturing, that is, of the fuel, power, mill supplies, containers and the like, are included in value added by manufacture. If we allow liberally for these, say $10,000,000,000, the value added by manufacture will be $35,000,000,000 out of $62,000,000,000, or 56 per cent of the total.[1] The value of all mineral products in 1919 was $3,158,000,000, of which at least $2,370,000,000 or 75 per cent seems to have been added by labor, supplies and the like, to say nothing about equipment. This 75 per cent is roughly comparable to the 56 per cent for manufactures. The value of all farm products in 1919 was $16,475,000,000. The value of the year's use of the farm land upon which this was produced, together with all farm buildings and land improvements, was approximately $3,316,000,000.[2] This is only 20 per cent of the value of the product. The other 80 per cent is added by labor, purchased feed, seeds, fertilizer and other supplies, and by live stock and equipment; and is roughly comparable to the 56 per cent for manufactures.

[1] Vol. VIII, p. 16.

[2] Calculated as 5 per cent of the value of all farms, this 5 per cent being a good average of the whole United States.

It is sometimes said of agriculture and mining that they derive a larger portion of the value of their product directly from nature than does manufacturing. This is sometimes made the basis of calling them extractive. If from the 20 per cent of the agricultural product representing the value of land use, could be deducted an allowance for all buildings and land improvements, such as land clearing, drainage and irrigation, a very small amount indeed would be left as the value of nature's contribution. But much of manufacturing is extractive in the same sense. Take, for example, a hydroelectric plant producing power and light; or a nitrogen-fixation plant which makes nitrate fertilizers from the nitrogen in the atmosphere; or even a plant which produces power from coal. Even such industries as lumber manufacturing, smelting and the like are but a simple short step removed from direct acquisition of all raw materials from nature. And all manufacturing industries draw upon the valuable natural properties of raw materials for a large part of the values of their product. Furthermore, a large part of agricultural production is of live stock and live stock products, which is surely as far removed from direct extraction from nature as a considerable part of manufacturing—steel manufacturing, for example. To put agriculture and mining in one class and manufacturing in another, is therefore not a very satisfactory procedure. It is partly for this reason that in this treatise both have been put into one general category called *primary production.*

In the figure used for cost of the materials of manufacturing in the foregoing analysis is included the cost of a large quantity of partly finished goods, and this results in a great deal of duplication. For example, the automobile engine maker is charged with the cost of his metals, and then the automobile manufacturer with the cost of the engine which he buys ready-made. But the value of the product is also duplicated—the value of the engine is taken as it leaves the engine factory, and again as it leaves the automobile factory.

It is also interesting to compare the total value of all materials furnished by farms, forests, mines, fisheries, approximately $21,000,000,000, with the value of all manufactured products derived from them. One difficulty with this is that a considerable quantity of farm products does not pass through a manufacturing process, or at least not through the manufacturing establishments caught by the census, and hence does not appear in the value of manufactured products. Included in this are the butter and cheese made on the home farms, most of the whole milk and eggs and fruits and vegetables consumed

at home, and all meat animals slaughtered at home or by local butchers and the like. A liberal allowance for these is $5,000,000,000. Since they mostly do not appear in the list of manufactured products, the proper procedure is to subtract the $5,000,000,000 from the $21,000,000,000. This leaves $16,000,000,000 of value of raw materials measured against $62,000,000,000 of value of manufactured products. But included in this $62,000,000,000 is the value of many products counted two or more times, and likewise all values added by transportation, storage and merchandising of farm products, ores, metals, engines, logs, lumber and the like. If these duplications and the values of other origin could be eliminated, we would have another figure for value added by manufacturing in the manufacturing industry which would probably be not far from 56 per cent.

4. *Transportation and Communication*

According to Table I, 7.4 per cent of all gainfully employed persons on January, 1920, were engaged in some one of the transportation and communication industries. This does not include Transportation's share of the 7.5 per cent of clerical workers. Only 7 per cent of the Transportation and Communication workers were females, and these were mostly telephone operators. Less than 1 per cent were 15 years of age or under, and these were mostly messengers and express men. In number employed, Telephone and Telegraph represented 11.2 per cent of the total, Water Transportation 6.0 per cent, Street Car Transportation 5.7 per cent, Highway and Other Street Transportation 37.0 per cent, Railway Transportation 34.3 per cent, and Miscellaneous, including pipe line, express and post, 5.8 per cent.

The $5,232,000,000 of income indicated in Table II comprises the following:

	Millions
Steam railway	$3,570
Pullman cars	34
Express	80
Street and electric railway	437
Light and power (private)	257
Telegraph	68
Telephone	280
Water	506
Total	$5,232

It thus includes Light and Power, not properly included in this classification, but omits Highway and Other Street Transportation,

a very important form of transportation, more important in number employed even than Steam Railway Transportation. The total is therefore at least a billion too low.

As pointed out earlier, not all transportation and communication is performed by transportation units, that is, producing units which make it their primary business to transport. Not only do farms, factories, and other primary producing units transport, but also stores, warehouses, households, etc.

A considerable part, perhaps a fifth in the aggregate of all transportation, is personal service production, the transporting of persons for their pleasure or direct benefit.

5. *Storage*

Even more than transportation, the storage function is performed by producing units not primarily designed for this purpose. A considerable amount of storage is necessarily incidental to and normally a part of primary production, transportation, merchandising and household production. The only strictly storage enterprises are warehouses and cold storage plants. Many sorts of enterprises, however, take on storage as a side line or supplementary enterprise; for example, railroads build terminal warehouses, transfer companies maintain storage for household goods, farmers build warehouses for potatoes, fruits, eggs, etc.

The census has no separate classification for storage. Those engaged in storage enterprises are mostly included under Trade and Transportation.

6. *Merchandising and Trade*

Merchandising or Trade consists of assisting in the transfer of ownership of goods and services. This assistance is mostly in the form of direct service either to persons or to other business units represented by persons. In order that such service shall be rendered effectively, however, considerable holding of goods in stock, transporting of goods, and changing their form may be necessary. But only when a merchant goes out of his way to do more storing or transporting than is incidental to merchandising, can he be said to be taking on these as supplementary enterprises. Wholesale merchants do a great deal of processing and packing of goods.

The farmer or manufacturer selling his own products is not here classified as engaged in merchandising as long as he sells only his own

product and sells it through the usual channels of trade. Similarly the housewife buying only for the use of her own family is not engaging in merchandising. The farmer or manufacturer who sells directly to the final consumer, however, is classified as having taken on merchandising as a supplementary enterprise.

Banks, insurance companies, real estate agents and many diverse types of business agencies are engaged in the merchandising type of production. The term merchandising therefore has not exactly the right connotation—perhaps "buying and selling" or "trade" are better.

Table I ranks Trade third in number of persons gainfully employed, with 10.2 per cent of the total. Also more of those listed as clerical workers, that is, stenographers, bookkeepers, cashiers, filing clerks, etc., probably belong in this classification than in any other. The principal groups listed under Trade in 1920 are the following:

	Thousands
Bankers, brokers, money lenders	162
Insurance agents and officials	135
Real estate agents and officials	149
Retail dealers	1,329
Store clerks	414
Commercial travelers	179
Salesmen and saleswomen	1,177
Laborers, porters and helpers in stores	125
Deliverymen	170

As to sex, 15.4 per cent of all listed under Trade are females. This is higher than for any group except the service groups. Eighty per cent of all females in Trade are either clerks or saleswomen. Of all clerks, 41.2 per cent are women; and of all salesmen and saleswomen, 30.7 per cent. Only 1.2 per cent of those indicated as gainfully employed in Trade are 15 years of age or under, and these are mostly newsboys and helpers in stores.

Table II isolates the income of only one merchandising group, namely, banking, at 1.3 per cent of the national total. The incomes of all the rest are included along with those of Professional and Domestic Service and Miscellaneous under "Unclassified" at 26.4 per cent of the total. In a similar study of incomes for 1921, mercantile incomes are indicated separately and represent approximately one-third of what are here grouped as unclassified.[1]

[1] Maurice Leven, *Income in the Various States*, pp. 32–33.

7. *Household Production*

On January 1, 1920, there were 24,352,000 households in the United States.[1] In each of these, production processes are carried on. First of all, there is the preparation of goods as they come from the market for final consumption in the household. This includes not only the preparation of food, but also of clothing and house furnishings. Besides cooking and sewing, there is the washing and cleaning and care of rooms. Finally, there is a vast amount of direct personal service rendered to members of the household. The census of 1920 indicated 35,224,000 females in the United States over 15 years of age.[2] Only 8,202,000 of these are counted as gainfully employed. The remainder of these, 27,022,000, are mostly engaged in taking care of the 24,352,000 households above indicated.

They are assisted in this, according to the census of occupations, by perhaps 1,500,000 domestic servants, laundresses, charwomen and cleaners, nurses (not trained) and nursemaids, cooks, etc. This is less than one for every sixteen households. Of course many charwomen, laundresses and cooks are employed in other than households in the ordinary sense of the term.

8. *Other Personal Service*

The other principal groups classified by the Census under Domestic and Personal Service are the following:

	Thousands
Barbers, hairdressers and manicurists	216
Boarding and lodging-house keepers	133
Hotel keepers and managers	56
Janitors and sextons	179
Restaurant and lunchroom keepers	88
Porters (except in stores)	88
Waiters	229
Bootblacks	15

Table I shows 3,405,000, or 8.2 per cent of the gainfully employed, as engaged in Domestic and Personal Service. About 1,900,000 of them are employed outside of households in the ordinary sense of this term.

Of the 3,405,000, all but 36 per cent are women and female children. The men are mostly barbers, janitors, cooks, porters and hotel and restaurant keepers.

[1] Vol. III, p. 34.
[2] Vol. IV, p. 378.

Attention is again called to the fact that the classification here observed is on the basis of producing units. A barber shop or a hotel is a producing unit; and so is a bootblack. The producing units here listed are not engaged solely in service production; in fact, some are more largely engaged in commodity production than service production—restaurants and hotels, for example. But personal service is an outstanding feature of the production of all of them; and this is what determines their classification.

9. *Professional Service*

The principal classes listed by the Census Bureau under this head are the following:

	Thousands
Teachers	762
Technical engineers	136
Trained nurses	149
Physicians and surgeons	145
Musicians and teachers of music	130
Clergymen	127
Lawyers, judges and justices	123
Designers, draftsmen and inventors	71
Dentists	56
Actors and showmen	48
Authors, editors and reporters	41
Photographers	34
College presidents and professors	33
Semi-professional pursuits	117
Attendants and helpers	32

Table I lists 2,143,000 as engaged in professional service, which is 5.2 per cent of all gainfully employed. Of this number, 1,016,000 or 47 per cent are women, of whom 84 per cent are either teachers or trained nurses.

Professional Service as here classified may be either commodity production, as by authors, artists, and photographers, or personal service production, as by dentists, physicians, and teachers. As already pointed out, this distinction is difficult to make in many cases. The producing unit is the school, the theater, or the individual artist or author.

10. *Public Service (not Elsewhere Classified)*

The principal classes listed under this head by the 1920 census are as follows:

	Thousands
Soldiers, sailors and marines	226
Policemen	82
Officials and inspectors (postmasters)	136
Guards, watchmen and doorkeepers	116
Firemen	51
Marshals, sheriffs, detectives	32
Laborers	107

The total is 771,000, of whom only 3 per cent are women. This is a long way, however, from being all the people engaged in the public service. It does not include, for example, the teachers in the public schools, postal employees other than postmasters, municipal utility workers, government clerks and stenographers, etc. Dr. King estimated 2,081,000 workers in the public service, outside of the army and navy. Between 1918 and 1920, however, the number of government clerks was reduced considerably, and it has been still further reduced since then. Table II credits 5.1 per cent of the national income to government workers, exclusive of soldiers, sailors and marines.

The producing units in the public service are the federal government, the various states and municipalities and local governmental units, the municipal heat, light and water plants and the like.

II. SHIFTS BETWEEN FIELDS OF PRODUCTION IN THE UNITED STATES

Most of the older countries have a fairly well established balance between their fields of production. If changes are taking place, they are mostly proceeding very slowly. Only following great inventions, such as those of the period before the so-called "Industrial Revolution," or great wars or other cataclysmic events, does the balance of the industries in most parts of the world shift with any degree of rapidity. In new countries, however, like the United States, Canada, and Australia, the shift may be very rapid.

The most striking shift in the United States is from agriculture to manufacturing. The best evidence of this is in the shift from rural to urban in the population. In 1790, probably less than 5 per cent of the population lived in cities of 2500 inhabitants or over; the 1920 census showed 51.4 per cent living in cities of 2500 or over, and 8.5 per cent more in incorporated places of less than 2500, making a total of 59.9

per cent living in cities and incorporated villages. Table VI gives the distribution of the population of the United States between city and country for the last four census periods. During this period, the percentage of population which is urban increased an average of 5.6 per cent each ten years. The population in "other rural territory" was only 40.1 per cent of the total in 1920, as compared with 57.0 per cent in 1890.[1] In absolute numbers, the urban population has increased during the period from 27 millions to 63 millions, or 134 per cent, while the rural population has increased only from 35.9 millions to 42.4 millions, or 24 per cent. From 1890 to 1910, the rural increase was 3.4 millions; from 1900 to 1910, 2.3 millions; from 1910 to 1920, only 0.8 millions. Thus the rural rate of increase is declining rapidly. On the other hand, the urban rate of increase is rising, from 8.0 millions between 1890 to 1900, to 12.1 millions between 1910 and 1920.

TABLE VI. SHIFT IN POPULATION OF THE UNITED STATES FROM RURAL TO URBAN, 1890 TO 1920.[2]

	PER CENT OF TOTAL POPULATION			
	1920	*1910*	*1900*	*1890*
Cities of 2500 or over	51.4	45.8	40.0	35.4
Incorporated places of less than 2500	8.5	8.9	8.3	7.6
Other rural territory	40.1	45.3	51.7	57.0

It is thus apparent that we are rapidly becoming much more of an urban than a rural people. This is especially apparent in some sections

[1] A large number of the people living in "other rural territory" are not engaged in farming, but are city people living near to cities, or are engaged in small rural manufacturing enterprises, such as butter-making, cheese-making, cotton-ginning or in industries like mining, quarrying or lumbering which are often carried on in a small way in the rural districts, or are merchants in small villages or at cross-roads points. If these and other similar groups are taken out of the 40.1 per cent only 29.9 per cent are left. This figure is to be compared with the 26.3 per cent of all gainfully employed persons in agriculture. The reason that a larger percentage of the population than of the gainfully employed persons is reported for agriculture is that the ratio of children to gainfully employed persons is much larger in the country than in the city, partly because of the higher rural birth rate, partly because so many young people migrate to our cities about as soon as they are old enough to go to work, either from our own farms or from farms in other countries. Immigrants are nearly all wage-earners, and nearly all of them go to work in the cities. See Vol. IV, *1920 Census*, p. 34, Vol. V, p. 894.

[2] *Abstract of the Census*, p. 74. The terms *rural* and *urban* are here used according to the census definition, rural meaning living in places of less than 2500 inhabitants.

of the country. Table VII shows the shift from rural to urban between 1910 and 1920 in a number of typical states. The greatest increases in percentage of urban population were in Michigan, Ohio, Illinois and the other east north central states. Many sections of these states are being rapidly industrialized. The New England states taken as a whole increased only 2.8 in percentage of population which is urban. This is because they were already very largely urban in 1910. The same situation prevails in large measure in the Middle Atlantic states. The southern group of states, on the other hand, increased 5.3 per cent in percentage which is urban. Many sections of some of the southern states are also being rapidly industrialized. How far the shift will go is one of the interesting problems confronting the United States. Our discussion of conditions in some of the older countries later in the chapter will throw some light on this problem.

TABLE VII. SHIFT OF POPULATION FROM RURAL TO URBAN IN TYPICAL STATES, 1910 TO 1920

STATES	PER CENT URBAN [1]	
	1920	*1910*
Massachusetts	94.8	92.8
New York	82.8	78.8
Ohio	63.8	55.9
Michigan	61.1	47.2
Iowa	36.4	30.6
Minnesota	44.1	41.0
North Dakota	13.6	11.0
Kansas	34.9	29.2
California	68.0	61.8
Maryland	60.0	50.8
South Carolina	17.5	14.8
Alabama	21.7	17.3
Texas	32.4	24.1

[1] In this table, the population of incorporated places of less than 2500 is classed as rural.

Number of persons employed, however, is only one basis of comparison of industries. In this same 30-year period, the number of manufacturing establishments in the United States increased only from 207,600 to 290,100, or 30 per cent, while the number of farms increased from 4,565,000 to 6,448,000, or 41 per cent. At the same time, the average farm increased in size from 136 to 148 acres. On this basis, it would appear that agriculture has kept up with manufacturing.

In terms of value of agricultural product, the increase between 1900 and 1920 was from $4,700,000,000 to $21,400,000,000. Most of this increase was of course due to changes in the price level, and particularly in the level for farm products. When this effect has been removed, however, there still remains an increase of 27 per cent.[1] This occurred while the population of the United States was increasing 39 per cent. Thus agricultural production, taking this period as a whole, kept pretty well up with the growth of population. But in the earlier part of the period, agricultural production fell behind the population growth. This is strongly indicated by the fact that agricultural exports fell off rather rapidly at this time. But exports increased again during the World War.

This apparent inconsistency between the shift in population from rural to urban and volume of agricultural production is explained by the fact that agriculture has been doing its work with less and less labor, so that fewer people are needed on the farms. The surplus farm population has migrated to the cities and helped swell the ever-increasing volume of manufactured products. Not only are more manufactured products being exported, but our home population is spending a constantly larger proportion of its income for manufactured products. While per-capita production of agricultural products has been about holding its own, per capita production of manufactured products has been increasing rapidly. The increase in value of manufactured products between 1900 and 1920, after removing the effect of the general rise in price level, was 101 per cent.[2] This is to be compared with a 27 per cent increase for agriculture between 1890 and 1920 and a 39 per cent increase in the population during this same period.

[1] Value of farm products, 1899 = $ 4,700,000
Value of farm products, 1919 = 21,400,000
Index of prices for farm products, 1899 = 64
Index of prices for farm products, 1919 = 231

[2] Value of manufactured products, 1899 = $11,407,000
Value of manufactured products, 1919 = 62,418,000
Index of all commodities prices, 1899 = 75
Index of all commodities prices, 1919 = 206

TABLE VIII. SHIFTS IN MANUFACTURING INDUSTRIES BETWEEN 1904 AND 1919, BY MAJOR GROUPS, INDICATED AS PERCENTAGES OF INCREASE.[1]

Groups of industries	*Number of wage-earners*	*Value of product*
Food and kindred products	83	337
Textiles and their products	38	323
Iron and steel and their products	82	327
Lumber and its remanufactures	14	152
Leather and its finished products	32	260
Paper and printing	45	254
Liquors and beverages	—19	20
Chemicals and allied products	88	421
Stone, clay and glass products	5	177
Metals and metal products other than iron and steel	71	208
Tobacco manufactures	—1	206
Vehicles for land transportation	262	1,164
Railroad repair shop	104	319
Miscellaneous industries	200	559
Average all industries	66	298

Important shifts have also taken place as between different manufacturing industries. Table VIII shows these shifts according to the fourteen groups previously listed in Table V. The average increase in number of wage-earners for all industries was 66 per cent, and the average increase in value of product was 298 per cent (not corrected for the rise in price level). The largest increase is in automobile and truck manufacturing. The iron and steel and the chemical industries also show significant increases; likewise foods and textiles, although the increase in textiles is principally in value of product. Lumber and leather manufactures show less than average increases. These shifts reflect in part a stage in the development of a relatively new country, and in part the effects of discoveries and inventions.

The mining industry is also expanding rapidly, particularly that part of it which is closely bound up with manufacturing. For example, bituminous coal production increased about 175 per cent between 1900 and 1918;[2] and pig iron production 145 per cent.[3] Copper production increased about 39 per cent from 1909 to 1919.[4] Anthracite

[1] Derived from Vol. VIII, *14th Census*, p. 146.
[2] *14th Census*, Vol. XI, p. 258.
[3] *14th Census*, Vol. XI, p. 337—1900 to 1920.
[4] *14th Census*, Vol. XI, p. 365.

coal production increased 53 per cent—this partly reflects the increase in population and partly a change in the fuel habits of the people.[1] Petroleum shows the most remarkable increase in output—293 per cent.[2] The increasing use of automobiles and trucks largely explains this. In contrast with the foregoing, gold production decreased over a half, and silver production about 5 per cent.[3] The important mineral resources of a well-developed country are surely its coal and iron and building materials and not its precious metals.

During this same twenty-year period, 1900 to 1920, the value of lumber products, after removing the effect of the rise in price level, increased only about a fifth.[4] All of this increase came before 1909. The number of wage-earners in the industry decreased from 911,000 to 839,000 between 1909 and 1919.[5] This decline has accompanied a shift in the location of the industry. The five leading states in lumber production in 1920 were Washington, Louisiana, Oregon, Mississippi and Arkansas, in the order named; the five leading states in 1900 were Wisconsin, Michigan, Minnesota, Pennsylvania and Arkansas, in the order named. The lumber industry is bound to decline still further. Much of the remaining virgin lumber is difficult of access, and the new growing timber is mostly still very young. It takes from 30 to 100 years to mature a crop of forest trees.

Transportation is constantly becoming a more important form of production. More commodities and persons are being transported, and many of them are being transported larger distances. The railway mileage of the United States has been nearly at a standstill for the past ten years. In fact, it has decreased since 1916, and is not likely to increase greatly in the future. But other forms of transportation are expanding in its place, particularly motor-bus transportation. The railway mileage of the United States was 194,000 in 1900 and 255,000 in 1920. During the same period, the number of passengers carried increased from 577,000,000 to 1,235,000,000; and the freight carried increased from 1,082,000,000 tons to 2,260,000,000 tons. The ocean transportation of the United States is increasing fully as rapidly. In 1900 the total clearings of all vessels in United States ports engaged in foreign trade was 56,000,000 tons; in 1920, the comparable figure was 108,000,000 tons. In 1900, only 22 per cent of the tonnage was

[1] *14th Census*, Vol. XI, p. 258—1900 to 1920.
[2] *14th Census*, Vol. XI, p. 312—1902 to 1919.
[3] *14th Census*, Vol. XI, p. 365—1909 to 1919.
[4] *14th Census*, Vol. VIII, p. 146.
[5] *14th Census*, Vol. VIII, p. 146.

carried in American-owned vessels; in 1920, 51 per cent of it was carried in American-owned vessels.

More transportation means more trade. In keeping with the increase in transportation has been an increase in merchandising and storage. The only data available to support this are those for percentages of persons gainfully employed in the different industries. Trade and transportation were combined in the 1900 census. In 1910, 9.5 per cent of all persons gainfully employed were in trade; in 1920, 10.2 per cent. For trade and transportation combined, the percentages were 16.4 per cent in 1900 and 17.9 in 1920.

III. THE BALANCE OF INDUSTRIES IN FOREIGN COUNTRIES

We will understand better the significance of the balance of industries in the United States if we can see what it looks like against a background of several foreign countries. Let us take first a highly industrialized country, like England (not including Scotland and Wales). In an area not quite so large as Illinois, England supports a population of 36 millions, nearly six times that of Illinois. This represents a density of population of 701 per square mile, as compared with 35 for the whole United States, 566 for Rhode Island, 479 for Massachusetts, 141 for Ohio, 43 for Iowa, 9 for North Dakota and 4 for Montana. The working population is distributed between industries roughly as follows: Industrial (including mining and transportation), 58 per cent; commercial, 14 per cent; domestic, 13 per cent; agricultural and fishing, 8 per cent; professional and government and defense, 7 per cent. The figure for the United States comparable to the 58 per cent "industrial" would be 41 per cent. The United States has over three times as many of its workers in agriculture than England, and over a fourth less in manufacturing, mining and transportation. The population of England is classified as 78 per cent urban and 22 per cent rural; but over half of those reported as rural work in cities or have industrial occupations. The rural population alone represents a density of 160 per square mile. Excluding those living in the country but not engaged in agriculture, would still leave a degree of labor intensity in agriculture much greater than maintains in the United States; but even this does not feed and clothe the large industrial population of England. Large quantities of food are therefore imported in exchange for the manufactured products sold. The raw materials of many of her manufacturing industries, particularly of her textile industry, likewise have to be imported. Her rich coal and

iron deposits located in close proximity to each other have been and still are an important factor in her industrial development. Closely associated with this industrial development, although antedating it in importance, is England's ocean shipping and foreign commerce.

Let us take next a new country, one still newer than the United States. Australia was first colonized in 1788, a century and a half later than the United States. It has an area almost exactly the same as that of the United States, but a population of only 5,400,000, less than 2 per square mile. Australia has developed rather slowly compared to the United States. This is partly because it is farther from Europe, partly because it has few harbors and navigable rivers, and partly because a large part of it is arid or semiarid and lies in the hot torrid zone. Only about 15 million acres of land are cultivated annually, as compared with 350 million acres in the United States. The continent is rich in minerals, and 4 per cent of its income in 1920 was from that source. Agriculture represents slightly over half of the national income, and forests and fisheries 3 per cent. This means that about 60 per cent of the national income is from the extractive and genetic industries, as compared with probably about 30 per cent for the United States. In 1921, Australian manufactures were employing only 387,000 persons, as compared with 12,818,000 in the United States. As time goes on, more of the population will be engaged in manufacturing and less in agriculture. Even between 1911 and 1921, the working population of Australia shifted from 28.4 to 31.2 per cent industrial, and from 30.4 to 25.8 per cent in extractive and genetic industries.

Let us next pass to a very old country, but one which is still highly agricultural, namely, India. Table IX following classifies the population of India according to the occupation by which it is supported. Here are 71.9 per cent of the people obtaining their living by agriculture, as compared with less than 40 per cent in the United States. Here are probably 90 million persons gainfully employed in agriculture as compared with 11 million in the United States. The land area of India is a little less than two-thirds of that of the United States. The density of population of the whole country is 177 per square mile; of the British province alone, 225 per square mile. About one-seventh of the land area is in forests, and about one-fifth in crops. The comparable fractions for the United States are one-fourth in forest and one-sixth in crops. Much of the interior of India is arid or semiarid. What land is cropped is intensively farmed; 21.5 per cent of the

cultivated land of India is irrigated. More rice is grown than all other crops combined. Wheat and cotton are next in importance. Although the census of occupations indicates that six or seven million families are earning their living from manufacturing industries, the census of manufactures reports only 4827 establishments employing 50 persons or over. Industry in India consists mostly of hand trades, such as weaving, wood carving and metal working.

TABLE IX. CLASSIFICATION OF THE TOTAL POPULATION OF INDIA IN 1911 BY OCCUPATION[1]

	Number of persons	*Per cent of total*
Pasture and agriculture	224,696,000	71.9
Fishing and hunting	1,855,000	.6
Mines and quarries	530,000	.2
Industry	35,323,000	11.3
Transport and communication	5,029,000	1.6
Trade	17,839,000	5.6
Public service	4,697,000	1.5
Professions	5,325,000	1.6
Domestic	4,599,000	1.5
All others	13,227,000	4.2
	313,470,000	100.0

The country of Europe which is most like India in balance of industries, is Spain. Over three-fifths of the workers of Spain are in agriculture, and only one-eighth in manufacturing. Fruit growing, relatively very important in Spain, is an intensive type of agriculture. Much of the interior has rather scanty rainfall. Wheat and barley are the principal field crops; sheep and goats the principal kinds of live stock. The sheep population of Spain is practically the same as its human population, and there are one-fifth as many goats as sheep. The manufactures are textiles mostly. The mines employ 1 per cent of the workers. The density of population in Spain is 109 per square mile.

France is much more industrial than Spain, but is still more of an agricultural than a manufacturing nation. Only 46 per cent of the population is urban, as compared with 51.4 per cent in the United States. Manufacturing has been handicapped in the past by a lack of coal. The principal manufacturing industries are textiles and woodwork—nearly two-fifths of the industrial workers are employed

[1] *Statesman's Yearbook*, 1923, p. 135.

in textile factories of one kind or other. Nearly a fourth of the land is in crops. Wheat, oats and potatoes are the principal field crops; but as much land is devoted to grapes as to potatoes. France has 1 head of cattle for every 3 in the population, as compared with 1 for every 1.7 in the United States. The density of population is 184 per square mile.

Belgium with an area one-fifth that of Illinois has a million more of population. Its density of population is 636 per square mile. Over 45 per cent of the land is in crops, but large quantities of food have to be imported. Belgium is a highly industrialized nation like England. The principal manufactures are iron and steel, glass, automobiles, artificial silk, linen, and handmade laces. The country has a supply of coal to support heavy industries like iron and steel, and an abundance of labor to support textiles and hand industries.

Denmark, in contrast to Belgium, is largely an agricultural nation. In 1921, 59 per cent of the population was classified as rural, as compared with 48.6 in the United States. Notwithstanding the fact that only about 350,000 are employed in factories, the density of population is 192 per square mile, slightly more than that of France. This is probably accounted for by the fact that Denmark's agriculture is of the live stock type. In 1922, Denmark had one head of cattle for every 1.3 of the population, as compared with 1.7 for the United States; and in addition one head of swine for every 1.7 of the population, as compared with one for every 1.9 for the United States. To feed all this live stock, considerable feed has to be imported. The exports are principally butter, eggs and bacon. Danish fisheries are also of considerable importance.

Sweden has been in the past predominantly a rural nation. In 1849, only 11 per cent of its workers were engaged in manufacturing. But at present almost half are in industry. Having a large supply of iron, but only a little coal of its own, Sweden exports a large quantity of raw iron ore. The census classification of population is 70 per cent rural, but this figure is somewhat deceiving, since many of the industrial workers live in the country. This is possible because manufacturing is largely decentralized. Much of it is based upon the products of Sweden's well-managed forests. Nearly 60 per cent of the whole area of Sweden is in forest. The other important manufactures are machinery, electrical equipment, porcelain and glass. Less than 10 per cent of the land is cultivated. The density of the population is 34 per square mile.

Norway has only 4 per cent of its land in cultivated crops and only 22 per cent in forests. Much of the rest is unproductive. The density of population is 21 per square mile. The most important industry is probably fishing, 85,000 persons being engaged in it. Forest products are next in importance. Exports of fish and forest products are exchanged for food and raw materials. The manufacturing industries are much like those of Sweden.

SUGGESTIONS FOR FURTHER READING

The principal sources of material for this chapter are the various volumes of the *Fourteenth Census of the United States*, particularly Volumes II and IV, "Population"; Vol. V, "Agriculture"; Vol. VIII, "Manufactures," and Vol. XI, "Mines and Quarries."

More detailed information on incomes may be found in the publications of the National Bureau of Economic Research. *Income in the United States*, Volume I of the series, contains a summary of incomes for the years 1909–1919. Volume II presents the detailed studies by W. I. King, O. W. Knauth and F. R. Macaulay. Maurice Leven in *Income in the Various States* (1925, Vol. 7), continues the studies through 1921. Reference should also be made to an earlier study by W. I. King in *The Wealth and Income of the People of the United States* (1915). Agricultural and forestry phases of the subject are discussed in an article called *Timber, Mine or Crop?* by W. B. Greely and others in the *1922 Yearbook* of the United States Department of Agriculture, and in an article called *The Utilization of our Lands for Crops, Pasture and Forests*, by L. C. Gray and others in the *1923 Yearbook.*

PROBLEMS

1. Construct a "clock-diagram" of the percentages of males and females combined in the 8 occupation classifications, using the data of Table I.
2. Construct a similar diagram for Table II.
3. What is meant by "value added by manufacture"? What are the sources of this value? In your judgment, how will the following industries rank in percentage of value added by manufacturing: watch-making, flour-milling, butter-making, furniture-making.
4. Why is agriculture sometimes called "extractive." Name several other kinds of production which are extractive in considerable measure.
5. How large a proportion of the productive energy of the people of the United States is probably employed in transporting commodities? How could this be reduced? Would it be economical?
6. Why is the classification of the fields of production used in this book better for an economic analysis than the one used by the census?
7. Refer to Table III on sources of agricultural income: Which gives the larger part of the agricultural income, crops or animals?

8. Write a definition of primary production.
9. Why is storage largely a side-line enterprise, or incidental to other forms of production?
10. What balance of industry would you expect to find in the following countries and why: China, Iceland, Argentina, Holland, European Russia?

CHAPTER IV

THE HISTORICAL BACKGROUND OF MODERN PRODUCTION[1]

The purpose of this treatise is to help the student to a clear understanding of the production of to-day; but there are numerous phases of the production of to-day which cannot be comprehended without looking into its past and seeing how it has come to be what it is. Furthermore, it is our purpose to understand in some measure the production of the whole world; and some of the peoples of the earth are to-day living in much the same way as our ancestors did two and three thousand years ago, as the Egyptians may have lived ten thousand years ago. One will probably find about the same assortment of ways of living and systems of production whether one follows, let us say, the present stock of Teutonic peoples back through their history to early tribal economy and beyond, or takes a cross section of all the peoples now living, beginning with the wholly commercialized modern city groups, then passing to the largely commercialized American or British farmers, then to the largely self-sufficing Chinese or Russian peasants, then to the Arabian tribesmen, then to the Filipino Igorotes or South African Bushmen.

In the pages which follow, we will speak of certain modes of living, or "economies," to use a term commonly accepted to-day. The principal economies described will be as follows: direct appropriation, hoe culture, pastoral, village, town, national and world. The village economy will be found to be principally an agricultural economy. In connection with town and national economy will be described the handicraft system and the domestic system, and following these the factory system. These various economies are more than modes of production; they are modes of living also. They also represent roughly, in the order in which they are described, the stages in the

[1] It would be impossible for the author to write a chapter on this subject without reflecting the point of view of his colleague Professor N. S. B. Gras. Readers who have a further interest in this phase of the subject should read Professor Gras' *Introduction to Economic History* (1922, Harper and Brothers). Footnote references are indicated for many of the specific facts taken from this source; but of course it has not been possible to provide for all of them.

evolution of modern society. Their chronology must not be taken too seriously, however; since evolution has not always followed similar lines among different peoples and cultures.

I. DIRECT APPROPRIATION

The simplest of these ways of living is by *direct appropriation* of nature's gifts. There still exist many peoples who feed and clothe and shelter themselves entirely in this way. For food, they depend upon the roots, stalks, foliage, and seeds and fruit of wild plants, the flesh of such wild animals as they can kill, and fish, and even insects. For clothing, they depend upon the skins of animals, or rude fabrics woven from grass or the fibers of native plants. For shelter, they live in caves, or in rude huts built from poles, skins of animals, grasses, and leaves of fibrous plants. The North American Indians lived largely by direct appropriation at the time the white men came, some of them entirely in this way. For example, Bancroft speaks of the Indians of southern California as living upon roots and berries, and such animals as coyotes, skunks, rats, crows, lizards, snakes, grasshoppers, and fish, the men not having developed their weapons far enough to be able to kill the larger animals.[1] Examples of people now living by direct appropriation are the Eskimos, the Australian aborigines, certain of the negro tribes of Africa, and the natives of such isolated islands as Madagascar and Terra del Fuego. The Eskimos live upon animal food mostly, the seal and the reindeer furnishing a large part of it. The seal also furnishes oil for fuel and light, and the reindeer the skins for clothing. In the summer months the Eskimos eat berries when they can find them, and certain kinds of moss. Some of these they preserve and store for winter in various ways.

The principal characteristic of such a mode of living is utmost adaptation to nature. Thus if the food supply is seasonal, peoples living by direct appropriation may have to wander from place to place, as do birds and other wild animals. They may live for so short a period in one place that they build only the rudest sorts of shelters, or perhaps none at all, depending entirely upon caves. The food supply may be hopelessly inadequate during certain seasons, making it necessary for them to preserve foods from season to season, or else fast during the scanty season. Few of them are forehanded enough to provide adequately for such periods, so that fasting and famine are likely to play a major rôle in such an existence.

[1] H. H. Bancroft, *The Native Races* (1886), Vol. I, p. 163.

We shall be interested in noting the extent to which *division of labor* or *specialization* is carried in each of these various economies. When specialization develops, some persons do only certain things, and do these not only for themselves but for others and in return have part of their wants satisfied by others. People in the stage of direct appropriation have very little division of labor. What there is is mostly between the sexes. In general, the men do the hunting and fishing and the fighting, and the women gather what roots, seeds, fruit and the like are gathered. If any food is preserved, the women are likely to do it. Even in this primitive economy the women also do the cooking and make the clothes. Probably the first specialist to develop among the men is the medicine man or priest, who in the beginning is a combination of lawgiver, preacher, teacher and healer. Also presently certain of the men develop special skill in making tools or weapons and devote a good share of their time to it. But this latter development does not proceed very far as long as the people are living directly upon nature's gifts and need few tools of any kind.

There is another phase of specialization to which some attention must be given even in this primitive economy—namely, what has been called "territorial specialization" or specialization by geographical regions or territories. Some sections of the country produce grain advantageously, others meat and milk, others fruits, etc. If some way can be found of exchanging these, then all can have grain and meat and milk and fruit, and a much more varied and better balanced diet in consequence, and probably at less expenditure of time and effort. Some people living in the stage of direct appropriation apparently met upon occasion in a friendly way and exchanged their surpluses of various foods and clothing. Perhaps those living on the coast exchanged dried fish or salt for wild honey or skins collected by tribes in the interior. The American Indians were apparently fully accustomed to the practice of exchange or barter when the whites arrived. Copper arrows, made from the natural copper of the Lake Superior district, have been found over a large part of North America. The Indians traded rather freely with the whites. A few had rude systems of money to use in exchange.

How far back one would need to trace the important peoples of the modern world to find them living by direct appropriation would be difficult to say. Only when the white men came did many native tribes of North and South America and Africa learn to provide themselves more bountifully in other ways. Some of the German tribes

were living in this way at the time the Romans first came in contact with them. The Greek writers tell us of a people who at certain seasons of the year lived largely upon locusts which they captured by building smudges in their line of flight, probably in much the same way as it is done to-day by certain native tribes of Australia, the Philippines and other East Indian islands. Earliest recorded history for such peoples as the Greeks and Egyptians shows them already far beyond this stage. Peoples living in such a way leave no records except their crude weapons and tools in caves and burial pits. Their culture was probably that of the so-called "Stone Age."

While it is customary to look upon such a way of living as representing a lower order of civilization, it is only partly correct to do so. The Eskimos, for example, are probably practicing a mode of living which is more suited to their environment than one which we would consider more advanced. A factory system would have a hard time flourishing in modern Greenland. A handicraft economy is no doubt better suited to the conditions in most interior cities of China than an industrial economy would be. On the other hand, peoples did grow out of one economy into another whenever physical or economic conditions were right for it. Some of the primitive peoples living by direct appropriation eventually became pastoral and then agricultural and then took on a handicraft economy, and then finally an industrial economy. Apparently the Teutonic peoples have made almost the whole succession of changes since the dawn of history. Apparently there has been a wide variation among the peoples of the earth in the time of their arrival at these different economies. Left to themselves, some probably never would have changed from one economy to another, but would have died out or have been submerged by their more aggressive neighbors. These differences seem to be due more to natural conditions than to anything else. Isolated peoples living upon remote islands or in the interiors of continents seem to have changed most slowly. The peoples living in regions of temperate or subtropical climate seem to have changed more rapidly than those living in either very warm or very cold climates. Most rapid changes seem to have been made in some of the great subtropical river valleys requiring irrigation or flood control, as in the valleys of the Nile, the Ganges and the Tigris and Euphrates.

II. HOE CULTURE

Variation from the simple direct appropriation economy takes two directions, one, that of simple agriculture, or "hoe culture" as it is commonly called, and the other, that of domesticating wild animals and using their milk and flesh as food, and frequently also using them as beasts of burden. Many of the American Indians had well-developed methods of hoe culture, as have many negro tribes of Africa to-day. Patches of land were cleared and dug up with rude tools and planted to the same crop year after year as long as the fertility held out, or until the tribe changed its residence. The trees were killed by girdling. The Indians in North America grew maize or "Indian corn" in this way. The early American colonists were taught how to grow corn by the Indians. In the Mississippi Valley section, the Indians planted their corn upon low mounds of dirt. They returned to the same corn fields year after year for the crop season. During the rest of the year, the tribe might wander from place to place in search of food just as it did before it took up hoe culture. No people seem to have taken up hoe culture completely or all at once. Instead, they started it upon a very limited scale, and then gradually increased it, no doubt in many cases under pressure of need for food for their growing numbers. Eventually it became the principal means of livelihood, and required that the tribe settle down in a definite locality. Thus the hoe culture stage gradually evolved into settled agriculture.

The work of tilling the soil at this stage apparently fell to the lot of the women in most cases, especially the work of keeping weeds down and scaring off the birds.

III. PASTORAL ECONOMY

While some peoples made the transition from direct appropriation to agriculture by way of hoe culture, more made it by way of animal culture. The evolution seems to have been from hunting wild animals and using their flesh and skins, to capturing them and propagating them and using not only their flesh and skins, but also their milk, and also using them as beasts of burden in most cases. All truly pastoral peoples in times past were nomads. This is the outstanding feature of their mode of living. The productive economy of pastoral life centers about the herd or flock. The herd is the principal source of

their means of subsistence. Men cannot live upon grass, but they can live upon animals which eat the grass. If they are to thrive, therefore, such people must organize their mode of living in such a way as to give the herd its best chance to prosper. A herd cannot pasture long in one place. This is especially true in the semiarid and almost arid regions where most of the pastoral peoples have lived. Some pastoral peoples have wandered much more than others. Some, like the Bedouins of desert Arabia to-day, have lived in tents and have always been on the move; others have moved mostly with the seasons, from the valleys to the mountains and back, or following the northward and southward movement of the belt of rains. The Kirghiz of the steppes of southern Russia have commonly traveled a thousand miles and back between summer and winter pastures. The earliest nomads probably followed their flocks on foot. The horse seems to have been one of the last of all animals to become domesticated. The mounted nomads had much greater freedom of movement. The tribes from central Asia which later overran Europe probably had cattle-drawn wagons in which the women and children rode while the men hunted and ravaged on their fleet horses.

It must not be thought that pastoral peoples gave up their collectional habits altogether. As peoples made the transition from direct appropriation to pastoral economy, they carried over their old ways of living. The herds merely became an additional source of food and clothing, making possible a larger population and better living. The men still continued to hunt, and the women to gather fruit, nuts and roots. The mounted nomads were mighty hunters, and the flesh of wild animals formed an important part of their diet. Some of the wandering of such peoples was more in search of better hunting or fishing, or of supplies of fruit, nuts and roots, than of better pastures.

Many of the pastoral peoples who moved with the season lived long enough in one place to grow some kind of a crop. Pressure of population presently induced them to give more attention to their crops. In this way they gradually settled down more and more, till in most cases they acquired regular abodes and sent their flocks away to other pastures for part of the year, much as the Swiss farmers of to-day send their herds of dairy cattle up into the mountains for the summer season. But this transition took a long while in many cases, and while it was under way the people would be found combining crop culture with animal culture. There are many tribes making this combination in Africa to-day. Others, however, such as the Bedouins

of Arabia, and the Todas of the uplands of southern India, still exchange wool and other animal products for the grains which they eat.

As long as such people kept on roving, they had no cities. There might be border cities or seaports at which they called for a few days to do a little trading; but the city had no place for their flocks. The unit of organization was first of all the family, then the clan, made up of several families having kinship, and then the tribe. They had no property in land, except that as families or clans or tribes they often fought to preserve claim to certain pastures to which they returned each year. As families, many of these peoples developed property in their flocks. The wealth of individual heads of families was often reckoned in terms of the size of their flocks, or the number of their wives.

This description of the pastoral nomads is not complete without some reference to their warrior habits. The mounted nomads especially were great pillagers. They overran most of central Asia and eastern Europe almost at will, and eventually penetrated to Rome and to Spain by way of northern Africa.

Specialization between the sexes was somewhat more developed in the pastoral economy than earlier. The men herded the flocks as well as hunted; the women did the work on whatever crops were grown. Simple hand manufacturing was of considerable importance in the pastoral economy. The wool from the flocks had to be made into yarn and woven into cloth. This was women's work. The men always had made all the weapons; now they began making whatever tools were used. They also took over the work of making leather and leather articles. Undoubtedly there was also some degree of specialization by persons—some became especially adept at making certain articles, or at certain operations, and devoted much of their time to them.

Most of the pastoral peoples did a great deal of trading. Their flocks gave them a surplus of wool, hides and other products; and their wandering brought them in contact with many other peoples. No people have ever developed the art of barter and higgling to a higher degree than some of our present day nomads, or recent descendents from nomads. The English word *barter* meant "to cheat" in its original form, as also the German equivalent of it, *tauschen*.[1]

The best examples of modern nomads, other than the Bedouins, Kirghiz, and Todas already mentioned, are the Algerians of northern

[1] Bücher, *Industrial Revolution* (S. M. Wickett, 1901), p. 40.

Africa, several tribes of southeastern Africa, and some of the tribes of northern Europe and Siberia which have developed a pastoral economy on the basis of the reindeer. Among the historical examples must not be forgotten the Hebrews at the time of their return from Egypt. The Book of Genesis contains many details which throw light on the early pastoral mode of living. One would judge from Cæsar's accounts that the Britons, except in Kent, were still in the pastoral stage at the time of Cæsar's invasion.

The best examples of peoples who made the transition from direct appropriation to settled agriculture by way of the pastoral economy are all found in treeless semi-tropical regions. In the forested regions of the earth, especially in the tropical forests, the pastoral stage never appeared. Farther north, it developed only in areas in which natural prairies were intermingled with the forests. Wherever land had to be cleared to procure a food supply, hoe culture was the transition stage to settled agriculture. Animal culture developed especially slowly in forested regions with long winters. It was hard enough to get food for man during the long winters, to say nothing about food for animals. The Indians of North America and probably South America never by themselves developed a pastoral civilization. This is probably due to the fact that none of the animals native to the western hemisphere were well suited to such culture. Given time enough, however, the Indians of our great plains might have domesticated the bison. Some of the tribes took over various forms of animal culture from the white settlers. The Navahos of Arizona have become sheep herders. The llama of the Andean highlands was only a beast of burden.

It will appear from the foregoing that pastoral economy can hardly be looked upon as a lower stage of civilization than hoe culture. They are more nearly parallel developments. It is true that pastoral peoples did pass from animal culture to partly plant culture, and then to mostly plant culture. But the hoe culture peoples were probably as slow about adopting animal culture as the pastoral peoples were about adopting plant culture.

IV. VILLAGE ECONOMY

In due time both the hoe culture peoples and the pastoral peoples came to depend so largely upon the food which they raised that they had to stay by and take care of it through the growing and harvesting period and then provide safe storage for it during the winter. This

meant building more or less permanent dwellings. These dwellings were erected in a cluster with the fields around them. Thus developed the *village*. In some regions the soil became less productive after a while, and the village had to be moved; but eventually even this practice had to be given up—there was no more unoccupied land to move to. If live stock was kept, it was generally pastured in permanent fields set aside from the crop land, and fed during the winter upon hay and other forage grown during the summer. But sometimes the herds and flocks were taken away to distant pastures for the summer. Since the occupation of such a village was almost solely agriculture, this stage in economy is frequently called the agricultural stage. The only difference between villages so far as their industry was concerned was in the proportion of their living that was obtained from plants and from animals. Some, like the American Indians living in what is now our eastern states, had no domesticated animals. The Indians of Pennsylvania at one time raised corn, potatoes, beans, pumpkins, cabbages and turnips. Some of the southern tribes, however, are reported to have kept poultry and swine; and the Bantus of East Africa depended chiefly upon animal food. None of them gave up their hunting and fishing and collectional habits altogether. In the early stages of village economy, the men and frequently the women too, often made long trips in season in search of supplies of fish, game, roots and nuts. When people living in villages reached the point where they used oxen or other animals to pull their plows and other instruments of tillage, then agriculture had truly arrived.

The process of settling down of peoples into villages probably began ten thousand years ago in Egypt or Babylonia or China, and it is not yet completed. The Algerian tribesmen, according to Professor N. S. B. Gras, are in the process of settling down at present, some of them already living in houses the year round, some in houses only part of the year, and some still roving and living in tents. The Kirghiz and some other peoples of central Asia are also slowly settling down.[1] The Greeks had already settled when the Illiad was composed about 1000 B. C. The Jews settled down mostly in the period of the Judges not long after their return from Egypt.[2] Apparently they had acquired a liking for settled living during their sojourn in Egypt. The Britons according to Sir W. J. Ashley, were settling down during the period of the Roman occupation, from the first to the fifth cen-

[1] N. S. B. Gras, *Introduction to Economic History* (1922), pp. 51–52.
[2] R. T. Ely, *Studies in the Evolution of Industrial Society*, (1903), p. 54.

turies A. D.[1] The Franks settled in present France during the fifth century A. D., and the Magyars in present Hungary in the tenth century A. D.[1]

Generally speaking, the houses in a village were built in a compact group for the sake of protection, with the fields, pastures and woodlots reaching out on all sides. One village really extended as far as the fields and pastures of the neighboring villages. In some cases, however, the peoples scattered their houses over the whole area, or in little clusters or "hamlets" of three or four, or in a row along a river or lake shore, as did the French settlers later in Canada.

There was a definite relation between the form of the village and the ownership of the land. In the compact village, the land was owned either in common or under a sort of copartnership arrangement. This was true of the crop land as well as the woodland, pastures and meadowland. Each family had a right to a share in the land, but could claim no specific piece of it as its own. The crop land in some areas was divided equally between the families in the village, in other cases equally among those of a given social status. Each family had a right to pasture a certain number of head of cattle or sheep or swine in the common pasture. In the scattered and river-bank villages, however, each family had its own land to itself. This in many cases was a later development.

In the early villages a piece of land was cropped until it would yield very little and then abandoned and allowed to "rest" for a period. This meant in many regions that it presently went back to natural grass and was used for pasture or meadow. Eventually crops began to be grown in rotation. In some of these rotations, land was kept in "fallow" for a year now and then, that is, tilled with no crop planted. The "three-field system" which came into use in most of Europe consisted of a three-year rotation of "spring grain, winter grain, and fallow." A village living under a system of common ownership of land and following this three-year rotation had its crop land laid out in at least three large fields, and each family had a "strip" in each field. As a matter of fact, there were frequently several other fields, so that one family might be farming on several different strips. Some of these strips might be several miles out from the houses of the village. This "strip system" of farming had much to recommend it at the time it developed, but it has long outlived its usefulness in most of the regions of Europe where it still persists. Here and there,

[1] R. T. Ely, *Studies in the Evolution of Industrial Society* (1903), p. 54.

no doubt, as in central France, it still answers well the local needs of small cultivators.

An outstanding characteristic of early village economy was slavery. It came about in two ways, either when the pastoral tribes in the period when they were combining crop culture with roving and hunting and plundering, made slaves of their captives instead of killing them; or when tribes of warlike nomads came in and conquered a village people and settled down among them. Thus the Celts were enslaved by the Anglo-Saxons, and they in turn were made "villeins" by the Normans. People who settled down were weak in defense. They were not used to fighting and they did not travel with horses. Moreover, they made good slaves because they knew how to till the crops.

Following slavery in most of Europe came serfdom. Some of serfdom grew out of slavery and represented a rise in the scale of freedom. But much of it seems also to have come as a result of a surrender of freedom with the rise of the *feudal* system. The early villages were "free villages"; that is, they were made up of *freemen* and slaves, and no freeman owed allegiance or service to any other man except the King. But a number of things happened in various parts of Europe to change this democratic organization of the village. In the decaying Roman Empire the greed of the tax collectors drove the weak defenseless free villagers to seek protection of the more powerful. In other regions it was protection against a developing class of greedy large landholders that made them seek protection; in other regions it was protection against marauding tribes. In return for the protection, they bound themselves to render certain services, and gave their land as security. Those to whom they thus bound themselves were generally the nobles, where such a class existed, owners of large fortified private estates in other regions, tribal chiefs or great warriors in other regions. In other regions, the same result was achieved by the process of borrowing money and taking a *precarious* title to one's own land in exchange for it. This meant that the money-lender virtually owned the land till the debt was paid. Very frequently it was never paid and the original owner became merely a tenant, who paid his rent in services or in kind (in the form of produce). By such a process as this did the feudal system develop. The free village became a manorial village, with all of the villagers owing services of various kinds to the manor lords. Their services in labor they performed mostly upon a portion of the village lands that was known as the lord's *desmesne*, all of the product of which belonged to

the lord. The free villages largely disappeared even in England. Remarkable as it may seem, nearly all people of the earth seem to have passed through a feudal period. The feudal age of China was about 2300 B. C.; of Egypt, 2500 to 1580 B. C.; of Greece, about 500 B. C.[1] The Russian feudal system passed away officially with the abolition of serfdom in 1861. The Mexican peon of to-day is virtually a serf, and the Mexican system of large landholding practically amounts to feudalism. The feudal system even obtained a foothold in the patroon system among the Dutch in the Hudson River Valley. The "feudal" system in England is ordinarily said to have lasted from the 10th to the 17th centuries; but abundant traces of it still remain.

Specialization became much more evident in the village economy. Most of the work on the land in the early villages was still done by the women, but later the slaves assisted the women with the outdoor work and may have done most of it. In due time, the men needed less time for fighting, and found hunting less profitable, and hence turned to the land. With the coming of serfdom, everybody worked on the land except the immediate followers of the manor lords, consisting mostly of soldiers. It has been suggested many times that the hard conditions of slavery and serfdom were necessary as a stage in economic development to accustom the men to the tedious grind of daily labor. There is no doubt much truth in the suggestion.

There was also considerable handicraft work to be done at this stage of economic development. Clothing and shoes had to be made; also kitchen utensils, tools for working the land, weapons, etc. The women made the clothing. The shoemaker early developed as a distinct craftsman; also the smith, the wright and the miller. With the introduction of Christianity, the clergy became an important distinct group.

The village was necessarily more isolated than the moving clan, and consequently was more self-sufficing. But still there was a good deal of trading. Salt, millstones and iron, for example, usually had to be brought into the villages of England from the outside. Wandering merchants began to bring in silk, spices and other luxury goods from distant lands and exchange them for wool or other surplus goods accummulated by the manor lords. One manor lord often controlled several villages, and sometimes a score or more. In many cases, one of these was the principal residence of the manor lord, and there was much movement of produce to this village from the others.

[1] N. S. B. Gras, *Introduction to Economic History*, pp. 77–78.

Also in the later stages some of the villages became seats of government or trading posts with a considerable population not engaged in direct production. These had to have food, clothing, shelter and fuel; and hence a general movement of certain supplies set in toward these points. It would hardly do to call these villages cities—Professor Gras prefers to call them *urban villages*.[1] No doubt there was also some exchange of surpluses between neighboring villages, and between villages in different parts of a region with different natural advantages. Each village generally had a market place where the different families exchanged their supplies with each other, and also no doubt where the produce from other villages was exchanged for local surpluses.

V. TOWN ECONOMY

The distinguishing feature of the next step in the evolution of society was the appearance of the *town* as distinguished from the village. In most cases, the towns grew out of a village. For various reasons certain of the villages differentiated from their neighbors and took on special functions and developed special agencies for handling them. In general, two new agencies appeared, the local *merchants* and the established *handicraftsmen*. In the village, family traded with family, or at the most with some craftsman or a traveling merchant. In the town, the peasants sold to local merchants and bought from local merchants. These merchants kept a stock of goods on hand waiting for their customers to come and buy. Of course a considerable portion of this stock of goods was obtained from outside the area. It included many of the wares formerly brought in by itinerant merchants, such as spices, and silks and other fine clothes, as well as salt, iron, tin, copper, millstones and other necessary supplies. The stores in the early towns were nearly always kept in the front room just off the street of the merchant's home. The handicraftsmen were workers specially skilled in the making of clothing, tools, weapons and the like, who established themselves in the towns and did nothing else. They worked in their homes, or more commonly in little shops attached to their homes and either made up a small stock of goods to be sold to customers upon call, or took orders and then made up the goods.

The customers of the merchants and craftsmen came from within the towns and from the surrounding villages. One town might have a score or more of villages whose people came to it to exchange their

[1] N. S. B. Gras, *Introduction to Economic History*, pp. 86–92.

produce for needed supplies. The villages still retained their little market places where the local people came to trade directly with each other; but these declined in relative and even absolute importance. People had more things to sell, and wanted more things in exchange of the sort that had to be brought in from the outside, or made by specially skilled craftsmen. The town craftsmen generally made better shoes and clothing than had been made in the individual homes, or by the village craftsmen.

These two developments did not come simultaneously. In nearly all cases, the towns developed their commercial functions before their manufacturing. The villagers kept on with their own spinning and weaving and shoemaking and gave it up very slowly.

Although commerce and manufacturing have appeared in earnest in the stage of town economy, we must not get the impression that the productive economy of society had greatly changed. Agriculture was still the principal basis of life. No doubt ninety per cent or over of the population still obtained its living by working on the land. This is clear from the following list of commodities which the country furnished to the towns: wool, flax, hides, lumber, charcoal, yarn, wine, cheese, butter, beer, not to mention the cereals and meat that were the main part of the daily diet of the people in most regions.[1]

The Guilds.—The merchants, one can easily imagine, were among the leading citizens of any town. Their fortunes were more closely identified with the town than those of any other group. Consequently they took an active interest in the welfare of the town. As a matter of fact, they really gave to the towns about all the government which they had at one stage in their development. Many practices grew up in the early towns which were contrary to the general welfare and particularly to the welfare of the merchants. To check these, the merchants in these towns formed an association to which the name Guild Merchant came generally to be applied. The principal object of the Guild Merchant was the regulation of trade. Prominent in this regulation was a restriction of trade to members of the guild. "And no one in the city of Southampton shall buy anything to sell again in the same city, unless he is of the Guild Merchant," says an old guild ordinance. And merchandise brought into the city must be first offered for sale to a guildsman.[2] Similar prohibitions were found in the ordinances of every guild merchant. But there were also ordinances

[1] N. S. B. Gras, *Introduction to Economic History*, pp. 122–156.
[2] Marshall, *Readings in Industrial Society*, pp. 76–77.

designed to promote peace, provide charity, and regulate the economic life of the town. The guild merchant also looked after the interests of the town in its relations with the manor lords and with other towns.

The merchant guilds were at the high point of their influence in the 12th century in England. Two things happened to destroy them. One was that their function as governing body of the town increased in significance. The other was that the individual crafts split off and formed craft guilds of their own, which left no function for the merchant guilds except those of a general nature. The craftsmen always had been members of the guild merchant. They were so classified because they bought raw materials and sold their product. As the handicraft side of town life grew in importance, it superseded the merchandising. The handicraftsmen were presently numerous enough to form guilds of their own. The different classes of merchants each formed guilds of their own, and also presently the professional groups, such as the clerks, judges and scriveners. Thus the Guild Merchant gave place to a large number of single-craft guilds.

The regulations of the craft guilds were as monopolistic as those of the Guild Merchant. The handicraft guilds endeavored to prevent persons not belonging to them from engaging in any kind of manufacture. They tried to regulate the quality of the product, its process of making, and the price at which it was sold. The elaborate apprentice system which they developed had the effect of keeping down the number entering the guilds. After serving several years as an apprentice at little or no wages, one wishing to enter a craft had to work several more as a journeyman before he could expect to become a master craftsman. So repressive were the conditions under which the journeymen worked that they often formed guilds of their own and opposed the craft guilds.

The craft guilds reached their greatest development in England in the last half of the 14th century. There were at least 110 craft guilds in London in 1422.[1] Following are names of some of the important guilds: armorers, chandlers, curriers, millers, furriers, drapers, glovers, hosiers, smiths, goldsmiths, vintners, bowyers, cooks, carpenters, shipwrights, pewterers, cutlers, painters, tanners, coopers, sawyers, plumbers, bakers, saddlers, joiners, tawyers, cordwainers, tailors, barbers. In countries whose manufactures are still largely in the handicraft stage, such as Turkey, China and India, the craft guilds function to-day much as in the Middle Ages in Europe.

[1] N. S. B. Gras, *Introduction to Economic History*, p. 137.

The Political Status of the Towns.—The town played an important rôle in the social economy in still another way. Some of them grew out of free villages. Even if they grew out of manor villages, they were largely independent of the manor lords so far as the essentially town functions were concerned. The merchants at least were free men, and so also were the craftsmen when they came. The manor lords could sometimes refuse permission to organize a guild merchant if they saw fit, but this would not avail them greatly. The king might grant a charter if the manor lord would not. As the towns grew in size and importance, they became rival influences with the manor lords, and eventually rival powers in many districts. The towns believed fully in self-government. To grow, they needed more people. Serfs who fled from the manors to the towns were allowed to become free men, according to the rule in England and western Europe, if they remained in a town for a year and a day.

In England, the towns were able to hold the positions they attained at this time, and to keep on developing. This had not been true of many earlier towns. The history of the older civilizations is replete with instances of towns which were wiped out. "A people climb the great heights of the town stage and then fall down," says Professor Gras. "The process begins over again, sometimes with the same result. How long this struggle has gone on, we cannot say; but during the last five thousand years of recorded history, the rhythmic rise and fall of towns is the outstanding event in the history of advanced peoples."[1] When the town was wiped out, the village took its place again. Here were two economies struggling with each other. The town always represented the higher civilization; but in the Old World of ancient and medieval times, the village was the more enduring. The towns developed within themselves in many cases the causes of their own destruction. As proof of his hypothesis, Professor Gras refers to Memphis and Thebes in ancient Egypt, to Babylon, to Tyre, and Sidon in Phœnicia, to Troy in Asia Minor, to Athens, Sparta and Corinth in Greece, to Rome, and to the old towns of France and England, like Lyon, Toulouse, Bordeaux, St. Albans, Chichester, York, Winchester. Some of these later recovered, but all were surpassed by new towns like Paris and Liverpool. The old town of London, however, recovered completely from its early setbacks.

[1] Marshall, *Readings in Industrial Society*, p. 110.

VI. NATIONAL ECONOMY

National economy represents as much a political as an economic development. In the feudal period, the manor lords were virtual rulers of the villages included in their domains. In England, the kings from William the Conqueror on kept a somewhat firm hand on the barons and made them subjugate their individual interests in part to those of the kingdom; but in the rest of Europe, particularly in the old Roman Empire, the manor lords did about as they pleased. The first check which the power of the manor lords received was from the guilds in the towns as described in the last section. The kings were at all times jealous of the power of the manor lords. They therefore welcomed the growth of the towns. By playing the town off against the manor lords, and in various other ways, they succeeded in many cases in taking away some of their power and influence.

A number of important developments in the world at large at this time also played into the hands of the kings. One of these was the development of navigation. This meant the opening up of new sources of supply and lowering the cost of foreign goods; and it also presently meant the exploration and settlement of the New World and the East Indies. The developing foreign trade furnished new outlets for domestic goods, for England principally, at first for raw materials such as wool and grain, then presently for manufactures. The expansion of trade to an international basis meant that the social economy had outgrown a local or sectional organization, that the day of national economies had arrived. There was need in such a situation for an active central government. Trade soon showed the need of regulation. The barons derived many advantages from this trade. They were now able to sell the surplus products of their estates and obtain money with which to buy many of the luxury goods of foreign commerce. They therefore offered little serious objection when the kings reached out and expanded their functions along these lines.

The second important development at this time was a strong international rivalry principally between England, Spain, Holland and France. This rivalry manifested itself primarily in exploration and colonization and foreign trade. It had its military phases also, wars being fought at one time or another between all four of these nations. The geographical position of these nations made them greatly dependent upon their navies in time of war. The same ships that carried foreign commerce could also be used in battle. Consequently foreign

trade and military strength went hand in hand. The principal need of the governments in this struggle for supremacy was money with which to finance armies and navies. Systems of national taxation were not well developed as yet in any of these countries. Gold was soon discovered in abundance in the New World. This gave still further incentive to exploration and settlement. Another way to get gold was to export goods and get gold in return for them. Accordingly manufacturing was encouraged in every possible way.

Mercantilism.—There was thus ushered into England, France, and the countries of western Europe generally, an era of intense nationalism and a régime of national economy. More than this, a whole politico-economic philosophy was developed to go with it. The name now given to the philosophy is Mercantilism, and the political economy which accompanied it is called The Mercantile System.[1] The essence of this system, according to the German economist Schmoller who made a careful study of it, was "the replacing of a local and territorial economic policy by that of the national state."[2] The nation now became paramount. The manor lords first lost most of their power; then the towns and the craft guilds. Those who managed the destiny of a nation now looked upon it as a large estate to be handled as a unit in carrying out whatever program seemed to them best for the nation. Queen Elizabeth in England exemplified this point of view admirably. Managing an estate as large as a nation in a program of this kind was a tremendous undertaking. The idea of democratic coöperation in national affairs had not yet arrived. The only way for a government to get anything done, according to the prevailing ideas, was to order it done or make a law covering it. The Mercantile System therefore carried with it an excessive amount of regulation. First of all, foreign trade was regulated. The exporting of raw materials and the importing of manufactured goods was greatly restricted. The purpose of this was to encourage manufacturing. This was supposed to have two desirable effects, one, the providing of goods for exports, and the other, providing work and subsistence for a large population needed in war-time. Effort was made also to prohibit the exporting of gold. A large agricultural population was desired also in order to provide abundant food and raw materials; but most of the measures adopted were actually detrimental to agriculture, although generally not so

[1] No effort is made in this account to trace the development of the mercantilistic philosophy or to distinguish between the earlier and later phases of it.

[2] G. Schmoller, *The Mercantile System,* p. 51.

intended. Internal trade was restricted by means of taxes on the local movement of goods and in various other ways. The most extreme forms which the regulation took were the fixing of prices of bread and many articles of food and clothing, attempting to confine the consumption of the poorer classes to mere subsistence goods, fixing of wages and rules of apprenticeship, and restricting the movement of the population between parishes. In Elizabeth's reign, a period of apprenticeship of seven years was prescribed for all artificers. Some of the more constructive measures adopted to carry out the national program were the following: immigration of foreign artisans to help introduce new industries, the stabilizing of currency, and the encouragement of banking and insurance.

The Domestic System.—A most important rôle in the development of national economy was played by what is now referred to as the *domestic system.* It was this system which broke down the handicraft guilds. The essence of the domestic system was the control of the manufacturing process by a new class of merchants which developed. In the handicraft guild system, the mastercraftsmen bought their raw materials, hired their workmen, and marketed their product. In the domestic system, the merchants furnished the raw materials and took over the finished product. What is more important, they furnished raw materials not only to mastercraftsmen, but to any who were able to do the work regardless of where they lived. Craftsmen living in villages took a great deal of this work to do. It thus becomes possible for a villager to live on his little farm and combine hand manufacture with his farm work. By the end of the 17th century, in some villages in England nearly every home was a small factory, and the manufacturing was more important than the farming.

The handicraft guild system probably broke down and gave way to the domestic system largely as a result of the growth of foreign and internal trade. This meant a widening of the market, which the small mastercraftsmen were in a poor position to take advantage of. In the first place, their function was primarily the making of the product. Their work kept them confined to their shops. The new order of things called for men who kept in touch with the market. Goods were also now wanted in larger lots than could be turned out by one shop; and their manufacture called for more capital than many mastercraftsmen could command. Accordingly the merchant stepped into the breach and became the marketer and the financier. The craft guilds

fought this development bitterly; but all they got for their effort was to see the important growth of their craft take place in the country villages for the next few centuries.

The governments were of course glad to see the craft guilds lose their control. Their monopoly practices stood in the way of a program of expansion of foreign trade. Most of the contests that arose between the craft guilds and the merchants were decided in favor of the merchants. The English government also brought in skilled textile workers from Flanders to teach the domestic artisans how to make a high grade of woolen cloth.

The Inclosures.—The development of national economy and the domestic system was accompanied by changes in agricultural organization so sweeping that they are frequently referred to as an agricultural revolution. The outstanding feature of the revolution is commonly referred to as the *inclosure movement.* It will be remembered that in the stage of village economy, the arable lands were mostly laid out in strips, and the meadows, pastures, woodlots and waste land were held in common. The inclosure movement consolidated these strips into fields and converted the common fields into farms owned by the landed gentry and leased to tenants. This movement was most rapid in England during two periods, first the period of the Tudor inclosures, from 1500 to 1550 mostly, and second the period from 1650 to 1850, but principally from 1750 to 1815. The first of these inclosures was largely of the common pasture and meadow lands for the sake of securing pasture and winter feed for sheep; the second, of whole manors or remaining portions of manors for the sake of securing fields for growing grain or for practicing a system of diversified grain and live stock farming with crops in rotation. The principal cause of the first inclosure movement was the development of a foreign market for wool and woolen goods and a rise in the price of wool. Grain prices also rose somewhat, partly because of foreign demand, but more largely because of the growth of industry in the towns. Also in London and other export towns, there appeared presently a new class of merchants, the wholesalers in wool and grain, who wanted these products in large quantities, and who began reaching out into the country and soliciting supplies of them. The lords are usually assigned a major rôle in this development. Undoubtedly they were more in favor of inclosure than were the tillers of the soil. They could get much more out of the land when it was used for sheep pasture than when it was

left in commons and in strips. But the tenants also assisted in it, particularly in what consolidating of strips occurred at this period.

The second inclosure movement was also stimulated by high prices and developing markets. The foreign wars from 1775 to 1815 were an important factor in the rise of prices. The actual inclosures, however, were not so important as the improvements in agriculture that they made possible. This period marks the establishment of scientific agriculture in England. Not long afterward, English farmers began to be called the best farmers in the world.

Although both of the inclosure movements in England undoubtedly improved greatly the quality of British agriculture, they caused a great deal of suffering in the villages. The village people either lost their rights in the common pastures, meadows and woodlots, or were paid an amount for them which represented far less than they were worth to them. In the Tudor movement, many of the leaseholders were denied a chance to continue their leases, and another class of villagers, known as "copyholders" were in many cases actually dispossessed of their lands. This left many of the villagers without means of support, and forced them to migrate to the towns. The same thing happened again in the later movement, but by this time emigration to America had set in in earnest. The government tried to cope with the situation in the first period by passing laws prohibiting the inclosure of the common lands, but was not able to enforce them. In the second period, at least in the early part of it, a special act of Parliament was required for each inclosure, and the villagers had to be compensated for all the rights which they lost. Between 1727 and 1845, Parliament passed nearly 1400 special inclosure acts.[1]

The inclosure movement was much later on the continent than in England. It did not begin in Germany till 1820, and is still far from complete in southwestern Germany. Inclosures have as yet hardly begun in Russia.

Summary.—Social economy is of course still organized on a national basis, and no doubt always will be. For a considerable period, however, in western Europe, especially, the national viewpoint in economic affairs was very greatly emphasized, and this period we have here called the period of National Economy. It is also commonly called the Mercantilistic Period. It lasted from the 16th to the middle or end of the 18th century. Other important features of it were the weakening of the handicraft guild system and growth of the Domestic System

[1] N. S. B. Gras, *A History of Agriculture* (1925), p. 171.

in its stead, and the two inclosure movements. The first of these came at the very beginning of the period of National Economy, and the second at the end of this period, and ran on into the next period to be discussed, the period of the Factory System.

VII. THE INDUSTRIAL REVOLUTION AND THE FACTORY SYSTEM

The period of town economy and national economy are frequently thrown together and called the Handicraft Period. During the whole period, lasting in England from the 13th century to nearly the 19th, manufacturing, although making considerable progress, was all by hand. For the first half of this period, it was largely controlled by the craft guilds; for the second half, largely by merchants operating under the domestic system. Now comes the "Industrial Revolution," which in a period of seventy years, from 1770 to 1840, changes manufacturing from a hand to a machine basis.

The basis of this change was the use of power. Water power and wind power had been used in a limited way for a long time. What was really needed to give machine manufacture a start was a generally available source of power like steam. Steam power was applied successfully to cotton spinning after 1785, to water navigation in 1815 and to a locomotive in 1829. While it is not easy to ascribe too much influence to power as a factor in the Industrial Revolution, one must not forget that without an accompanying large volume of invention, it would have made slow headway. Many of the important early inventions, such as Kay's flying shuttle for use in weaving, and Hargreave's spinning jenny, were designed for hand power. The textile industry led the way in the early part of the Industrial Revolution. Hence the invention of the cotton gin in 1793, enabling one negro slave to do the work of a hundred, making cotton much cheaper and greatly increasing its supply, was a large factor in the rapid growth of the movement.

Progress in iron manufactures was also important, not only in that it made it possible to turn out iron tools of all kinds at greatly lowered prices and gave England another line of products for export, but also that it helped greatly in developing successful machinery. English iron production increased nearly six hundred fold during the century of the Industrial Revolution.

Along with this use of machinery and power came the factory system, involving the concentration of large numbers of workers at one plant, the development of a high degree of division of labor between

workers in one factory, the ownership of the instruments of the production by a capitalist class, and a greatly increased volume of production from one establishment. The productivity of labor under the factory system increased many fold. Adam Smith writing as early as 1776 described a pin factory in which 10 workmen turned out 48,000 pins in a day, under a system of division of labor which broke the manufacturing process into eighteen operations.[1] Considerable progress had been made in some industries toward factories or central workshops before power machinery came into use. The advantages of division of labor were known long before the Industrial Revolution. We would no doubt in time have developed something approaching a factory system if the steam engine had never been invented. But we would not have had a change so rapid that we could call it a revolution.

The improvements in transportation that came at the same period were an important part of the revolution. Without them, it would generally not have been possible for one factory to sell a sufficient volume of produce to warrant the use of machine methods and division of labor. The tin peddler from Connecticut who carried tinware at first on his back and later in wagons to almost every village and hamlet in the Atlantic states is an interesting illustration of what the problem of transportation of a factory product was like in the early days of the Industrial Revolution. First roads were improved, then canals, and then after 1830 railroads began to be built.

With the widening of the market came a still greater separation of marketing and manufacturing and the appearance one after another of the various types of middlemen who play such a prominent part in the economic life of to-day. Also cities came to be differentiated into industrial cities and commercial cities. The industrial cities developed near sources of supply of raw materials or power; the commercial cities at seaports or important junction points in transportation routes. In England, London became the great commercial city, with Manchester, Leeds and Sheffield as the industrial cities. In the United States, New York became the great commercial city, and Pittsburgh, Cleveland and Detroit great industrial cities. Of course no city is ever all industry or all commerce. Some, like Chicago, are about as much one as the other.

The industrial era like the mercantilistic era had a philosophy of its own—the philosophy of *laissez-faire* or non-interference. This

[1] *Wealth of Nations*, Bk. I, Chapter I.

had really developed earlier in the century in France and England as a reaction to the extreme interference of the previous period. The essential idea of it was that society and the state would prosper more if each individual was let alone and allowed to seek his own self-interests. Adam Smith gave a very effective presentation of this philosophy in his *Wealth of Nations* published in 1776 just on the eve of the Industrial Revolution. The interesting aspect of this is that although such a philosophy might have worked out fairly well in practice in an era of small handicrafts, and surely would have been an improvement over the extremes which mercantilism attained in the 17th century, it was not suited to the industrial era which was just upon them. English factory owners in the early decades of the last century gave such an exhibition of what competition wholly without regulation may degenerate into that the civilized world does not care to have it repeated even as an object lesson. The working day was commonly from twelve to fourteen hours, and women and children between twelve and seventeen years of age worked along with the men. Working conditions were often exceedingly insanitary. The result was the passage of a series of "Factory Acts" regulating the employment of labor in factories. The United States is still passing factory acts. Numerous laws have also had to be passed protecting the purity of foods.

The Industrial Revolution is commonly said to have lasted in England to 1840, and to have been continued somewhat longer in France and Belgium and the United States. All that can be meant by such a statement is that the factory system had become pretty well established by this time in these countries. The changes that produced the revolution and gave us the factory system are still under way. Later developments in the production of power—the gas engine, the dynamo, the electric turbine, and long-distance transmission of power—have been of more significance than the steam engine itself. Surely no one wishes to say that the end has been reached. Improvements in transportation and the widening of the market have kept pace with the developments in power.

Agriculture has shared in many ways in the rapid developments of the last century and a half. The productivity of labor in growing wheat in the United States was multiplied by the use of machinery alone nearly 20 times between 1830 and 1900; in growing hay, over 5 times; in growing corn and potatoes, over 3 times. Developments in farm machinery since have probably nearly doubled all these

figures. The growing industrial populations have furnished a market for increasing food and textile supplies. This has permitted agriculture to expand into the new fertile lands of the Americas, Australia and Africa. Improved transportation has brought the products of these areas within reach of the great industrial centers.

On the other hand, without these improvements in agriculture and the expansion into virgin areas, it would not have been possible for the industries to have grown as they did. The population of Europe increased from 90,000,000 to 180,000,000 between 1700 and 1800; and to 400,000,000 by 1900. About the beginning of the Industrial Revolution, many leaders of thought were predicting a shortage in the world's food supply. The changes wrought in industry, transportation and agriculture set all their forecasts awry.

VIII. THE UNITED STATES

The people who settled the United States in the beginning left Europe at a time when the craft guilds were largely broken down and the domestic system was in full sway. Consequently no craft guilds of any importance ever developed here. Early manufacturing was carried on entirely in the homes and small shops. Many of the manufactured goods needed were imported from England. The national policy of England in this period, it will be remembered, was to import raw materials and export manufactured goods, and she treated her colonies like the rest of the world in this respect. The colonies did what they could themselves to develop home industries. They laid down regulations as severe as any of those in mercantilistic England. Massachusetts imposed a heavy fine upon any person who did not send his hides to a domestic tannery. Bounties were offered for the manufacture of cloth, leather, iron, paper, etc. But all this had little effect. The leading industries other than agriculture were lumbering and fishing and ocean shipping. The New Englanders developed an important carrying trade in goods between the colonies, the West Indies and Europe.

The Revolutionary War produced a pronounced change in the attitude of the colonists toward domestic manufacture. It not only forced them to rely upon their own resources, but made them take a patriotic interest in developing them. The first important cotton factory was started in Rhode Island in 1790. In 1804, there were four cotton mills in operation. Then came the great war between England and France with its restrictions upon the commerce of the

United States. From 1807 to 1815, American ships lay mostly at their docks and the people were again forced to rely upon their own manufacturers. By 1811, there were 87 cotton mills in operation. In 1816, following the war, Congress passed a tariff act protecting our infant manufacturing industries. Later acts of 1824 and 1828 raised the tariff rates. By this time, the factory system had fully arrived in the United States. The Industrial Revolution came with less disturbance in the United States than in England for the reason that it did not have to displace a well developed domestic system. The factory system grew up with the country. The growth of industry was rapid. Our farms furnished abundant supplies of cotton and wool for the textile industries, and of hides for the leather industries. Coal and iron were available in close proximity to each other. The supply of timber seemed inexhaustible. While the total population was increasing from four million to sixty-three million, or nearly sixteen times, between 1790 and 1890, the urban population was increasing from 134,000 to 18,000,000, or 136 times. The government has continued its policy of protecting important manufacturing industries. In fact, it has continued to protect them long after they have ceased being infants. The time has now surely come when it will be better national policy to cease stimulating manufacturing and give agriculture a chance to maintain itself in proper balance in the economy of the nation.

IX. WORLD ECONOMY

The foregoing is not intended to serve as a complete account of the historical development of modern production, but rather to furnish an historical background for it. As an historical account, it is particularly deficient in its treatment of the modern period; however, the other chapters in the book mostly concern themselves with production in the modern period, and to include a detailed account here would involve a great deal of repetition. In addition certain chapters, such as those on the organization of exchange and transportation, and the chapter on the economics of cities, will fill in particular parts of the historical account in more detail.

From what has been presented, however, we can already discern the broad general outline of the modern economic world. There are peoples now living under all the various economies that have been described—a few still in the stage of direct appropriation, a few more in the pastoral stage, and a great number, probably one-half the pop-

ulation of the earth, living in the stages of village and town economy, with agriculture on the village basis, and manufacturing on the handicraft basis and carried on mostly in shops or in households. Such a description fits densely populated India and much of the East Indies, China, most of Russia, and a large part of the Balkan countries and Italy and Spain. Only western Europe, the United States and Canada, Japan, Australia, South Africa, and parts of South America have really adopted the factory system on any considerable scale, and several of the last-named of these countries are still largely agricultural because of their newness.

But whether or not they have acquired a factory system of manufacture, they have all been affected greatly by modern developments in the field of production. They have probably been most affected by improvements in transportation and communication which have brought them into contact with the rest of the world, which have given them a market for their products and have brought the products of the rest of the world to their doors. There is scarcely a village so remote that it does not feel some tiny current from the stream of world events ebbing into it. We are already living in an era of *world economy*—not a fully developed world economy, to be sure, but enough of such an economy so that it furnishes the key to an explanation of the most important developments of the future. Each decade from now on will see the peoples of the world brought more closely into contact with each other, and each country influenced more by events in all the other countries. It took the World War and its after-effects to reveal to many people that we can no longer live in a régime of isolated national economies. Nations will of course try to be independent and self-sufficient, to set up trade barriers around themselves and to shut the rest of the world out. But they will not long succeed. Even when they think they are succeeding because their program seems to be working at certain points, they will generally find that they are failing at more other points. National economic policies we will continue to have. But they will continue as in the past, only more so, to be ideals rather than actualities; and as ideals they will increasingly give up the false notion of isolation and self-sufficiency.

In a régime of world economy, national boundaries largely lose their significance. Great cities like London, Paris and New York lose their characteristics as national markets. The currents of trade flow not between these great national cities, but more directly between great producing and consuming areas like the cotton area of our South

and the cotton manufacturing region of England, like the wheat areas of the United States and Canada and the great consuming area of western Europe. Professor Gras has shown in his *Introduction to Economic History* how producing and consuming areas tend to develop their own cities or metropolises which serve as their trade link with the rest of the world, through which they establish many of their important outside connections. Thus Chicago serves as a connecting link between many of the economic activities of the corn belt of the United States and the outside world; Minneapolis and St. Paul as a similar link between the spring wheat area and the outside world. The economy of the present world, according to this analysis, is largely that of a "metropolitan economy" working within a larger world economy.

SUGGESTIONS FOR FURTHER READING

The reader has already been referred to Professor Gras's *Introduction to Economic History*. His Chapters V and VI on "Metropolitan Economy" cover in considerable detail the later phases of economic development.

Professor Gras's more recent book, *A History of Agriculture* (1925), treats in more detail and in admirable fashion the agricultural phases of the subject. Chapters II, IV, VII, and IX will be especially valuable.

Another interesting approach to the subject is found in Part I of Professor Richard T. Ely's, *Studies in the Evolution of Industrial Society*.

Other sources for English economic history are W. J. Ashley's *An Introduction to Economic History*, E. Lipson's, *The Economic History of England*, and R. H. Tawney's *The Agrarian Problem in the Sixteenth Century*.

Clive Day's *History of Commerce* (1912), traces the development of trade from a world point of view. R. B. Westerfield's study called *Middleman in English Business* (1915) is valuable for many details in the growth of the marketing system.

For American Economic History, the following references are valuable: E. L. Bogart's *Economic History of the United States*, and Katharine Coman's *Industrial History of the United States*. Attention is also called to W. L. Thorp's *Integration of Industrial Operation*, Census Monograph III, p. 21, for a discussion of the emergence of the factory system.

PROBLEMS

1. Which do you think was the shortest stage, that of direct appropriation, hoe culture, or pastoral economy? Why?
2. Which of the above stages would support the largest number of people per square mile?
3. Compare the medieval village with a modern village.

4. Was private property an institution characterizing the economy of the very early stages of society? What were the earliest forms of property?
5. Name the principal points of difference between village and town economy.
6. To what body or bodies found in our modern cities might the guild merchant be compared?
7. In what respects did the craft guilds differ from the guild merchant? Which was developed first?
8. What were the principal factors in the development of the national economy?
9. What was mercantilism? Do we find any evidences of mercantilistic policy to-day?
10. What stage of industrial organization succeeded that of the handicraft guilds?
11. In what particulars did it differ from the handicraft guild organization?
12. List the disadvantages of the strip system of farming.
13. List the benefits resulting from the inclosure movement; the immediate adverse effects.
14. Trace the steps by which the laborer has passed from slavery to employment in our modern factory system.
15. What is meant by *laissez faire?* Give examples of *laissez faire* policy which persist in our present industrial organization.
16. Indicate a number of the principal effects of the Industrial Revolution.
17. Why did not industry in the United States pass through the same stages as in England?
18. Has our tariff policy been an example of mercantilistic or of *laissez faire* policy? Our laws regulating working condition in factories?
19. List a number of the metropolitan centers of the world and give briefly the principal reasons for the existence of each.

PART TWO

SPECIALIZATION AND COMPARATIVE ADVANTAGE

CHAPTER V

THE PRINCIPLE OF COMPARATIVE ADVANTAGE

Our account of the historical background of modern production in Part One brought out nothing more significant than the constantly increasing amount of specialization in the world, and the high degree of specialization which society has now attained. It is the purpose of Part Two to analyze this specialization, see what it consists of, what it is based upon, and how it works. Specialization occurs, as already pointed out, between different *persons*, and between different *areas* or locations. Specialization between persons takes the form of different persons having different occupations, or different tasks. Specialization between areas or locations takes the form of different areas or locations turning out different products. Specialization between persons and areas combined sometimes takes the form of different producing units, such as different farms or factories, turning out different products. These three forms or types of specialization will be discussed in Part Two.

Let us take a simple case of specialization between persons for our first analysis. A young physician is just opening office to begin his first practice. Consequently his practice is very light and he has an abundance of time upon his hands. In such circumstances, he will probably handle all the record-keeping and correspondence himself, take care of his own instruments and mix his own powders. In time, however, if he is a competent physician, and has the proper manner, and has located in a city of appreciable magnitude, he will have more practice than he can handle alone and attend to his records and correspondence besides. At this point, he will hire a "secretary" who will do this latter work for him, answer phone calls and make appointments for him and the like. It will be of advantage for him to do this because in the extra time released to him he will be able to look after enough additional patients to more than pay the salary of this secretary. Perhaps he pays the secretary $80 per month, and his gross income will be increased by twice this amount. This is possible, of course, because physicians are much better paid for their time than are secretaries.

Furthermore, the chances are that a properly trained secretary will keep his records and write his letters in less time and better than he can. Thus there is a saving both ways. Now if his practice grows still more, he may employ a nurse to help him look after his patients during office calls, and take care of his instruments and supplies. As a next step, he may take in a young physician as a partner and let him handle the routine time-consuming cases. He now devotes his time to handling only the important or difficult cases. He is now a full-fledged city physician! Each step in his progress to this end, unless taken prematurely, has been to his economic advantage. Each step has released more of his time for the doing of more important things. Each step has increased his *net income*, because it has increased his *gross income* more than his expenses. Each is a step toward greater specialization.

The phenomenon which we have here observed is one which is repeated at every hand. A business office of any magnitude whatever uses at least a stenographer to good advantage. A small manufacturing plant making butter operates at distinct advantage if it has business enough to warrant a butter maker's assistant and a bookkeeper. The grocer whose business is large enough so that he can employ a cashier, a bookkeeper, and several specialist salesmen has an advantage over his competitors. These are all examples of specialization between persons.

Now let us take a simple example of specialization between areas or localities. Let us assume that the areas are two countries, and that one area has iron but no copper, and that the other has copper but no iron. Under such circumstances, the only way that the two countries can obtain their supplies of both iron and copper is to exchange. It did not take the human race very long to discover the advantages of specialization in a case like this. But suppose that both countries have deposits of both iron and copper, but that one country has a much richer iron than copper deposit, and the other a much richer copper than iron deposit. The two countries can if necessary supply their wants for both iron and copper at home. But surely it will not pay them to do so. If the country with the rich iron deposit will concentrate on iron production, and the other on copper production, and then the two countries will exchange their surpluses of the metals, both will get their supplies of iron and copper much more cheaply than if they each worked both their iron and their copper deposits.

Specialization under such cases calls for a little higher order of

mental process. The human race probably had to advance a little higher up the social scale before it could see the advantage of exchange of goods in such cases. In fact, there are many individuals, some of them in high places, who even to-day fail to comprehend the purpose of exchange in such cases and are insisting that each nation shall be "self-sufficing" and produce everything that it needs at home. Nevertheless, specialization has everywhere developed under such circumstances. Perhaps economic force has driven people to specialize in such cases against their belief and understanding! The result is that to-day there are many poor iron deposits that are not being worked, and also many poor copper deposits, and the world gets its supplies of these metals principally from working only areas with rich deposits, and this in spite of the fact that many nations have erected barriers to keep out foreign supplies of these metals.

The same situation maintains in agriculture. Many countries could produce their own wool as well as their own pork if they had to. But it pays them to produce only one of them and to exchange a surplus of this for what they need of the other—and so with wheat, corn, oats, flax, hay, apples and all the other farm products. Because of the number and variety of competing agricultural products, actual situations in agriculture are likely to be highly complicated. Here is a tract of land in southern Iowa upon which, among others, any one of the following crops may be grown with more or less success: corn, oats, barley, clover hay, timothy hay, wheat, rye, potatoes, apples, pears, peaches, strawberries, raspberries, currants, cabbage, peas, radishes. Here is another tract five hundred miles to the north in western Minnesota upon which the same crops, except pears and peaches, can be grown with more or less success, and in addition sugar beets and flax. Upon examining these two areas, however, we do not find them growing all the crops of which each is capable, but instead the Iowa area grows much more corn than anything else, and the Minnesota area more wheat than anything else. The principal reason for this is that although each region can grow all the crops in its list, it cannot grow them equally well. What it does, therefore, is to grow the crops which it grows to best advantage. It grows much more of these than it needs itself, and exchanges its surplus of them with other areas for crops which these other areas produce to advantage. In this way it can procure its supply of things that it could produce for itself only at a disadvantage, for much less than it could produce them for itself. This arrangement releases a large amount of its area

for turning out a larger surplus of the crops in which it has an advantage. Both regions are probably obtaining their peaches and strawberries from somewhere else. Thus does specialization work out as between farming areas. Scarcely any region, however, specializes to the extent of growing one crop only, as we might expect from the analysis thus far presented. There are special reasons, later to be presented, why this does not happen.

In analyzing the advantages of specialization by areas, due account must always be taken of the factor of transportation. If the iron deposits of one country are just a little better than those of another country, and there is a long transportation haul between, then it may not pay to specialize. The bulkier the product, the more likely will transportation costs consume all the other advantages of specialization. Certain perishable products may require refrigeration in transit upon so expensive a scale as to prevent a high degree of specialization in their production. The other marketing costs must be combined with transportation costs in all such analyses.

It should be pointed out that the area which specializes in a given product is not always the one in which yields are greatest. For example, deposits of iron may lie unworked in the United States which are richer than deposits now being worked in Germany or Sweden. The reason for this is that the United States may have more productive alternative uses for its labor and capital than have these other countries. The United States may be growing corn on land that would produce more wheat per acre under similar cultivation than much land now used for wheat in Italy. The reason for this will be apparent from the following illustration, in which the numbers represent assumed returns per unit of production elements in the two countries:

	United States	*Italy*
Wheat	40	30
Corn	50	10

Wheat yields are higher in the United States than in Italy by a ratio of 4 to 3; but Italy produces wheat three times as advantageously as corn, whereas the United States produces corn somewhat more advantageously than wheat. If the United States and Italy were the only two countries in the world, Italy under the foregoing assumptions would surely specialize in wheat and the United States in corn. *Comparison of returns must be made not only between countries, but between different products in each country.* The comparison within the

United States is as 4 is to 5 for wheat and corn; within Italy it is as 3 is to 1. The comparison between countries is of the ratios 4:3 and 5:1. Obviously wheat has the more favourable ratio in Italy, and corn in the United States.

If the returns were such as to give ratios of 4:3 or even 4:2 for the United States and 3:1 for Italy, the United States would still specialize in corn and Italy in wheat. Only ratios such as 4:1 for the United States and 3:1 for Italy, or 3:1 for the United States and 3:2 for Italy can cause the specialization to be reversed.

Illustrations of situations such as the foregoing occur freely in agriculture. Thus southern Iowa may grow more wheat per acre than western Minnesota, and yet grow very little wheat, for the reason that it enjoys greater superiority over western Minnesota in growing corn and probably over most of the rest of the earth besides. Rye is not ordinarily grown in the land that will grow rye best, but upon light sandy soils or relatively poor clay soils. The rich alluvial soils will grow large yields of rye, but they grow still larger yields of corn and wheat; whereas the light sandy and poor clay soils will grow fair crops of rye, but only poor crops of corn and wheat. As between corn and rye on the rich alluvial soil, corn has the advantage; as between corn and rye upon the sandy or poor clay soils, rye has the advantage. This situation repeats itself all over the world. Much of the world's rye is grown upon soil so light that the yield is only fair; likewise potatoes and beans.

But although it will be found in many cases that no other crop yields so well relatively in the region as the one grown, this is by no means always the case. For example, an area may be capable of producing an excellent crop of sugar beets, and yet be found in actual use growing only a reasonably good crop of corn. The reason for this is that there is an abundance of land in the world for growing sugar, either from cane or from beets, and only a relatively small amount of good corn land—in both cases, of course, relative to the world's needs for these crops. The result is that some land that might grow sugar beets well, as along the northern edge of the corn Belt, is planted to corn, although only fairly well suited to corn. Only in this way does the world get enough corn, and not too much sugar. If the world's demand for sugar were to treble, the demand for corn remaining the same, some of this intermediate land would be diverted to sugar beets away from corn and potatoes; if the world's demand for pork were to increase even 10 per cent, a large amount of this intermediate land

would be diverted to corn from sugar beets, potatoes, wheat, hay and several other crops. Thus the world's need for a crop determines how much land and what land will be planted to it. A crop which an area grows less well than some other crops, may be in more demand than these other crops, and hence have first choice over them for the area. In this way, it turns out that many regions are growing certain crops whose yields are not the highest relative to other crops in the same area. Crops of limited use, such as flax, cantaloupes and strawberries, may very easily have much more land highly adapted to their use—so far as yields or location are concerned—than they need, and hence give over some of it to crops to which it is less suited.

In the foregoing paragraph the "world's needs" are talked about almost as if they were independently determined and rather definitely fixed. This is far from being the case. Consumption in the long run adjusts itself pretty well to production. Thus if there is a region which will grow no grain crop so well as rye, its people will be found eating a great deal of rye. This will be especially true if the people are living close to the margin of subsistence. There is considerable land on the earth which is suitable for very limited uses, for the growing of wool, perhaps, or wheat. Under such circumstances, this land will surely be used for wool or wheat as the case may be, and the world's consumption will be adjusted so as to make use of the resulting supplies of these products. If the population is not large enough to use all that can be produced on such land, then the poorest of it will be idle. If all were used, the price of wool and wheat would be so low that one could not afford to grow them on these poorer lands. An increase in population would bring more of these lands into use. No doubt a good part of the world's wool, wheat and timber is grown upon land which has only one or a few possible uses.

All in all, therefore, specialization works out in a rather involved way as between areas in agriculture. The crop which is grown in an area may be one in which the area outyields the rest of the world or most of it; or it may be one which merely outyields other crops in the same area, in some cases being about the only crop that can be grown at all in the area; or it may be one which neither outyields other areas, nor which outyields other crops in the same area, but which is grown because the world's demand for it is such that only by using this land for it can the demand for it be met. Further than this, the complete explanation of why a particular crop is grown in a given area is likely to involve a mixture of all these reasons. For example,

sugar beets are grown north of the Corn Belt both because corn has first choice of all available corn land in the Corn Belt itself and because sugar beets have a higher sugar content in the cooler climates. Apples are grown in the Ozark Mountains of Missouri both because the land is too rough for general cropping, and because its soil and topography are well suited to apple orchards.

Specialization as between persons frequently works out in much the same way as between areas. Each person, as already pointed out, tends to do those things which he can do to best advantage; but this does not mean that tasks are always performed by those who can do them best. In fact, quite the contrary is the case. In the example of specialization by persons given above, the secretary did the record-keeping better than her employer-physician could have done it. However, many a small-scale business man in the country could do a better job of bookkeeping than his bookkeeper. Many a manager could do a better job of supervising the details of operation of his plant than do his foremen. Many a store operator could do a better job of selling than many of the salesmen. But if the business man kept his own books, he would have little time left to transact business; if the manager handled all the supervision, he would have little time left for matters of general policy; and if the store manager spent his time waiting upon customers, no one would be left as competent as he to do the buying.

Also as in the case of areas, many persons are doing what they do only because it is about the only thing they are able to do. This is true of most common laborers and common factory workers and of most sales girls in department stores. The world's needs for different kinds of work are as important as the world's needs for different crops. It seems as if there never would be enough of artists and inventors and the like. At least, anyone who displays to the world any such superior ability is almost sure to find himself making use of it presently to the exclusion of all else.

Likewise many a person in the world to-day is not doing the thing for which he is best fitted or best trained, but instead something else which no one else can do so well as he, even though he is not especially apt at doing it. There was other work to do and no one else especially fitted for it, and so he stepped in and did it. A parallel case is that of a coach building up a football team. He may have a man who would make an excellent tackle, but he is well supplied with tackle material and is short of material for the fullback position, and so takes his

most promising tackle out of the line and makes a fullback of him because he will make a better fullback than any other available man. The individual man may not show up as brilliantly in consequence; but the team as a whole will win more games. Hence, although in general the individual is usually found doing the task for which he is best fitted, there are many occasions when it is a task for which he is only fairly well fitted, but for which no one better fitted is available. There is a tendency, it is true, for the individual to do the thing he can do best; but it is only a tendency, and it is frequently offset by countertendencies.

Statement of the Principle.—The foregoing illustrations should suffice to show us in a general way how specialization works out as between persons and areas. Illustrations could be presented of specialization as between different live-stock products, timber products, mineral products, or as between different factories or stores, but the analysis would be the same. It is customary to reduce the phenomena of specialization as we have just described them to the form of a principle, known variously as the Principle of Specialization, or the Principle of Comparative Advantage, or the Principle of Comparative Cost. In this text, two principles will be stated. First is the Principle of Specialization, expressed as follows: *Each area tends to produce only a few things—frequently only one—and to sell its surplus of these, and with the proceeds buy the other things needed.* A slight change in the wording will give the principle as applied to persons. Stated in this form, the principle is entirely obvious. The examples given illustrate it; but it hardly needs illustration. Manifestations of it are everywhere about us. Each worker at a trade is proof of it, each person at a profession, each farm, each factory.

The nub of the problem, however, is not in the foregoing simple statement, but in the determination of *what things will be produced and what will be bought.* The statement of the principle which covers this phase of the question is called the Principle of Comparative Advantage, or Comparative Cost. Comparative Advantage and Comparative Cost are merely reciprocals of each other—the greater the advantage, the lower the cost; the less the advantage, the greater the cost. In this text, we shall speak of comparative advantage, because cost is a term which we do not understand very well as yet. The Principle of Comparative Advantage is the most difficult of all economic principles to state—it must include so many and such

different circumstances under which a given person or area tends to specialize in a given product. Sometimes it is stated in the following simple form: Each area tends to produce that which it can produce at comparative advantage. But this statement largely begs the whole question—what is comparative advantage? Let us first attempt a statement which defines comparative advantage in terms of areas along the lines of the foregoing analysis: *Each area tends to produce those products for which its ratio of advantage is greatest as compared with other areas, or its ratio of disadvantage is least, up to the point where the land may be needed by some products less advantaged in the area in order to meet the demand for them at such prices as will come to prevail under such circumstances.* This statement provides for the comparison between different products in the same area, and between the same products in different areas, and also for the influence of the demand.

A similar statement of the principle as applied to persons would read as follows: *Each person tends to do that work in which his ratio of advantage is greatest as compared with other persons, or his ratio of disadvantage is least, up to the point when his services are needed for work which he does less well, in order to meet the demand for this work at the prices that will come to prevail under such circumstances.*

It will be noticed that all the foregoing principles are carefully stated as *tendencies.* This is done very advisedly. Few if any economic principles are positive and unfailing in their action. Almost always there are countertendencies, and frequently indeed these are so potent that they completely overcome the tendency affirmed in any given principle. While there is a pronounced tendency for each person or area to be engaged in producing one or a very few things, and for these things to be those in which they have comparative advantage, many obstacles or countertendencies intervene and prevent a complete consummation to this end. Actually, therefore, many commodities will be found produced under circumstances not warranted by the principle of comparative advantage.

The Nature of Advantage in Production.—The term *advantage* as used in the foregoing statements probably needs a little more explanation. Larger yields of crops can nearly always be obtained by using more labor and fertilizer. The reason that one area obtains larger yields of a crop than another may be entirely that it uses more labor and fertilizer than the others. True advantage must be measured under equivalent conditions. The assumption in the foregoing statements is always that the same

kind and amounts of labor, fertilizer, equipment and supplies have been used, and that all conditions of production are the same except for those which are necessary parts of the persons or areas or producing units whose advantages are being compared. Or else the labor, fertilizer, etc., used in each case are measured, and the product obtained is calculated in each case *per unit* of the labor, fertilizer, etc., used. Thus comparative advantage between Belgium and the United States might be expressed as bushels of wheat per laborer, or per day of labor; or as pounds of steel per hour of labor. Practically speaking, it is in this latter form that advantage is nearly always compared. It seldom happens under actual conditions that two areas or producing units use exactly the same amounts of the various elements in production, and hence products must be reduced to a per-unit basis. Since ordinarily several different elements are used in any production process, the product must be compared per unit of each of them, or all of them combined. Making this combination has some difficulties, which will be discussed in later chapters.

We also need to examine more closely the way in which comparative advantage works out in various situations. It will be advisable to take the simpler situations first. The first case will necessarily be so simple as to be largely hypothetical. Let us assume first two countries A and B, both producing wheat and coal, and both consuming the same amounts of each product.

CASE I

	Country A	*Country B*
Wheat	10	10
Coal	5	5

Case I represents two countries whose ratios of advantage are clearly such that there will be no exchange between them. Both will produce all their own coal and all their own wheat. The figures used in these various cases represent *the products per unit of the elements of production employed* in the two countries—they therefore furnish a basis for comparing "advantage" in production in the two countries, in the meaning of that term explained in the preceding paragraph. In each of these countries, under the conditions here laid down, a unit of coal will be worth two units of wheat. Hence nothing can be gained by exchanging.

Case II also illustrates a situation in which there will also be no specialization and no exchange. Although A is twice as efficient as B

in the production of both wheat and coal, the ratio of efficiency in production of wheat to efficiency in production of coal is the same in the two countries. Two units of wheat are worth one unit of coal in both countries, and there will be nothing to gain from exchanging.

CASE II

	Country A	*Country B*
Wheat	20	10
Coal	10	5

Country A will of course be a much more desirable place in which to live and work than Country B, because productive effort wins twice as great a return in Country A. This might induce immigration and emigration, but not an exchange of products.

Now let us consider several cases in which exchange will be carried on. The first of these is Case III, in which A is exactly as much better than B in the production of coal, as B is better than A in the production of wheat.

CASE III

	Country A	*Country B*
Wheat	15	20 (= 35)
Coal	20	15 (= 35)

Under these conditions, 2 units of production elements in A and 2 in B will produce 35 tons of coal and 35 bushels of wheat. But in Country A, 20 tons of coal will equal 15 bushels of wheat, or 1 ton of coal will equal $\frac{3}{4}$ bushels of wheat; while in Country B, 15 tons of coal will equal 20 bushels of wheat, or 1 ton of coal will equal $1^1/_3$ bushels of wheat. Now if Country A were to specialize in the production of coal and send it over to B where it equals $1^1/_3$ bushels of wheat, while in A it equals only $\frac{3}{4}$ of a bushel, A would gain $^7/_{12}$ of a bushel of wheat, if it obtained all of the advantage. Or looked at from B's point of view, if B received all of the advantage, it would gain $^7/_{12}$ of a ton of coal. In all such trading, of course, no country receives all of the advantage; instead it is divided somewhere nearly equally between them, the exact division, however, depending on circumstances.

Assuming that the gain is divided equally, and that one ton of coal is sent from A to B for one bushel of wheat, then A by producing only coal can produce 40 tons of coal with the same two units of production elements, and B can produce 40 bushels of wheat. Thus there is a net increase of 5 tons of coal and 5 bushels of wheat, and each country

enjoys the same products, but a larger amount of them. These are the gains from specialization.[1]

CASE IV

	Country A	Country B
Wheat	15	25 (= 40)
Coal	20	15 (= 35)

In Case IV, A is better than B in production of coal in the ratio of 4 to 3, while B is better than A in production of wheat in the ratio of 5 to 3, and 1 ton of coal in A equals ¾ of a bushel of wheat, and 1 ton of coal in B equals $1^2/_3$ bushels of wheat. If A could get all of the advantage, it would gain $^{11}/_{12}$ of a bushel of wheat for each ton of coal sent to B; and if B got all the advantage, it would gain $^{11}/_{15}$ of a ton of coal for each bushel of wheat traded. But assuming that the gain is divided and the products are exchanged one for one, then if A specializes in coal, it can produce 40 units of coal and trade 20 of them to B for 20 bushels of wheat, gaining 5 units of wheat by the specializing. Likewise B can produce 50 bushels of wheat, and if it trades 20 bushels with A for coal, it will get 20 tons of coal, as against 15 tons before, and it will also have 30 bushels of wheat as against 25 bushels before. Of course this gain might be divided differently, but however divided there would be a total gain of 5 tons of coal and 10 bushels of wheat for the two countries.

In Case V, one country is superior to another in production of both products, but not superior in the same ratio.

CASE V

	Country A	Country B
Wheat	24	12 (= 36)
Coal	18	6 (= 24)

Here A is twice as efficient as B in producing wheat, and 3 times as efficient as B in producing coal. In A, 18 tons of coal equals 24 bushels of wheat, or 1 ton of coal equals $1^1/_3$ bushels of wheat. In B, 6 tons of coal equals 12 bushels of wheat, or 1 ton of coal equals 2 bushels of wheat. Using the same analysis as in Case III, if A receives all of the advantage, it will gain $^2/_3$ of a bushel of wheat for each ton of coal sent to B; or if B receives all the advantage, it will gain ¼ of a ton of coal for each bushel of wheat exchanged.[2] From this, it is evident that A will tend to specialize in coal, in which it has the greatest advantage, and B in wheat, in which its disadvantage is least.

[1] See Case V for method of determination.
[2] See Case V for method of determination.

This case also serves to illustrate the relation of demand to comparative advantage. Suppose that A completely specializes in coal and B in wheat; then A will produce 36 tons, or twice as much as before; but this is 12 tons more than both produced before. If B specialized only in wheat, however, it would produce only 24 bushels, which is 12 bushels less of wheat than both produced before. But this would mean an overproduction of coal and low prices, and an underproduction of wheat and high prices, which condition surely would not long continue. Surely A would begin producing wheat as well as coal. If we could assume that A and B together would produce and consume exactly as much coal as before specializing, A could produce all the coal wanted by using $1^8/_{24}$ of its productive units in mining coal, leaving $^{16}/_{24}$ units to produce 16 bushels of wheat. Country B, specializing in wheat only, would produce 24 bushels. This makes a total of 40 bushels of wheat, a gain of 4 bushels. If we assumed that the same amount of wheat was produced and consumed, but more coal, the total coal produced would be 27 tons, a gain of 3 tons. But probably the increase in production and consumption would be shared between coal and wheat. Suppose it was shared in the same ratio as the wheat and coal consumption before the increase: then the gain would be $2^4/_{34}$ bushels of wheat and $1^{14}/_{34}$ tons of coal.[1]

[1] Following is the method of computation of these results taking Case V as an illustration:

CASE V

	Country A	*Country B*
Wheat	24	12 (= 36)
Coal	18	6 (= 24)
	1 bu. wheat = ¾ ton coal	1 bu. wheat = ½ ton coal
	1 ton coal = $1^1/_3$ bu. wheat	1 ton coal = 2 bu. wheat

Assume, First, that the same amount of coal is wanted but more wheat: then 1 $^8/_{24}$ units of productive effort in A will produce 24 tons, leaving $^{16}/_{24}$ free to produce wheat, which at the rate of 1 unit of productive effort for 24 bushels would produce 16 bushels of wheat. B completely specializing in wheat would produce 24 bushels, making a total production of 40 bushels for the two countries, a gain of 4 bushels.

Assume, Second, that the same amount of wheat is wanted but more coal: B specializing in wheat would produce 24 bushels, leaving A to produce 12 bushels in order to bring the total crop up to the required 36 bushels. A could produce this 12 bushels of wheat with ½ of a unit of productive effort, leaving 1½ units to be used in the production of coal. The productivity of 1½ units of effort when producing coal in Country A is 27 tons, giving a surplus of 3 tons gained by specializing.

Assume, Third, that the productive effort saved by specialization is directed toward the production of both wheat and coal in the same proportion that these commodities are now produced, that is, 36:24. Note also that the surplus effort is available only in Country A and that the rates of productivity are such as obtain

The five cases thus far presented cover all the principles involved, but are so simple compared with the usual conditions that they may lead one to confusion when confronted by actual cases of comparative advantage. Let us next try out some cases which are nearer to actual conditions. First let us simply add a third country, C, to our previous illustrations; we will then get relationships similar to those of Case V between Countries A and B, A and C, and B and C.

CASE VI

	A	*B*	*C*
Wheat	24	20	12
Coal	18	16	15

As between A and B, A will produce wheat and B coal. As between A and C, C will produce coal. As between B and C, C will produce coal and B wheat. But since A has the greatest advantage in produc-

in that country. The first step is to determine the total amount of effort which will be available for producing the surplus goods. With Country B specializing completely in the production of wheat, the situation will be as follows:

	Country A	*Country B*
Wheat	12	24 (= 36)
Coal	24	(= 24)

It requires ½ of a unit of productive effort in A to produce 12 bushels of wheat and $1\frac{1}{3}$ units of productive effort to produce 24 tons of coal. The utilization of $1\frac{5}{6}$ units of productive effort in A when distributed as indicated results in a total commodity production for the two countries equal to the production prior to specialization. There is then a saving of $\frac{1}{6}$ of a unit of productive effort resulting from specialization. This surplus effort available in Country A is to be used in the production of both wheat and coal so that the returns resulting therefrom will be in the proportion of 36 wheat to 24 coal. The solution of a simple algebraic equation gives the answer needed.

$\frac{1}{6}$ unit = amount of productive effort to be applied in Country A.
Let x = amount of this effort to be expended in wheat production.
Then $(\frac{1}{6} - x)$ = amount to be expended in coal production.
The ratio now becomes:
$24x : 18(\frac{1}{6} - x) :: 36:24$
which reduces to:
$576x = 108 - 648x$

$x = \frac{108}{1224}$, or $\frac{3}{34}$ = the amount of energy to be expended in producing wheat.

$\frac{1}{6} - \frac{3}{34} = \frac{4}{51}$ = the amount of energy to be expended in production of coal.

The amount of each commodity gained by specialization, assuming that the surplus effort be expended in the ratio of 36:24, would be as follows:

$\frac{3}{34} \times 24 = 2\frac{4}{34}$ bu. of wheat.
$\frac{4}{51} \times 18 = 1\frac{14}{24}$ tons of coal.

ing wheat, it will tend to specialize in wheat producing; and since C has the least disadvantage in coal production, it will tend to specialize in coal. Whether, however, A will produce only wheat and C only coal, and what B will produce, and how much will be gained by such specialization, are questions which cannot be answered definitely. If we make the assumption that more of both coal and wheat are wanted in approximately the same ratio as now, 56 of wheat to 49 of coal, then A will specialize only in wheat and produce 48 bushels, C only in coal and produce 30 tons; and B will have to produce both, but will specialize more in the production of coal. Assuming the same 2 units of production elements in each country, B will use .597 of a unit of production for wheat, producing 11.94 bushels of it, and 1.415 units in the production of coal, producing 22.448 tons of it. This will make a total of 59.94 bushels of wheat and 52.448 tons of coal. This will be a gain of 3.94 bushels of wheat and 3.448 tons of coal. But as a rule when more goods are produced, they are not wanted in the same ratio. If less wheat was wanted and a great deal more coal, we might find B and C producing only coal and A mostly wheat but some coal also.

If, as in Case VII, we get still nearer to the actual by adding another commodity, say cloth, to Case VI, the problem becomes still more involved, and any mathematical analysis will probably confuse rather than clarify.

CASE VII

	A	*B*	*C*
Wheat	24	20	12
Coal	18	16	15
Cloth	16	20	18

It is quite apparent, however, that A would still tend to specialize in wheat because it has an advantage over both B and C. But would B still produce both wheat and coal? Would C produce only coal? Surely B or C would produce the cloth, as they both have an advantage over A. If we consider only coal and cloth for B and C, clearly C is at a disadvantage in both, but the disadvantage is less in coal—a ratio of 15:16 is greater than a ratio of 18:20—therefore B would tend to specialize in cloth and C in coal.

If more of each commodity were wanted than could be supplied by complete specialization, C would produce cloth and perhaps in extreme cases wheat. For B, coal would be the second product. For A, coal would be second if B and C could not produce the amount wanted, and in extreme cases even a little cloth might be produced.

Case VIII represents conditions very nearly as they actually are in the world—several countries and several products. Country A is a country fairly well balanced between agriculture and manufacturing, but rather short of iron. Country B is a richer nation with more advantages both in agriculture and in other industries. Country C is quite clearly a manufacturing nation. Country D is primarily an agricultural nation, but probably too far north to grow corn, and poor in mineral resources. Country E is a relatively poor country at a disadvantage in all lines.

CASE VIII

	A	*B*	*C*	*D*	*E*
Wheat	24	25	20	40	5
Corn	10	30	22	5	2
Oats	15	28	18	30	8
Coal	18	15	28	5	10
Iron	5	14	30	5	9
Cloth	16	18	25	10	10
Shoes	14	16	26	9	8

In such a situation, it is of course very difficult to tell what commodities each country will produce. Let us take the most evident cases of advantage first: B is superior in the production of corn; C is superior in the production of coal, iron, cloth, and shoes, but has the greatest advantage over all others in iron, second advantage in shoes, third in coal, and fourth in cloth. Country D is superior in wheat and oats. Now let us take the cases of least disadvantage: Country A when compared with the countries with greatest advantage has the least disadvantage in coal; then in order, cloth, wheat, shoes, oats, corn, and iron. Country E has least disadvantage in cloth; then in order, coal, shoes, iron, oats, wheat and corn. Accordingly there would be a tendency for the wheat to be produced in D, the corn in B, the oats in D and B, and the coal in A; the iron in C, the cloth in E, and the shoes in C. But the relative demand for the various products might change a country's advantage or disadvantage. For example, if more wheat was wanted than D could produce, we could no longer consider A's disadvantage as relative to D by a ratio of 24 to 40, but as relative to its nearest competitor, B, at a ratio of only 24 to 25. Country A would then be the second country to produce wheat, and wheat would now have the least disadvantage in this country instead of coal as before.

Under the actual conditions that maintain in the world, all countries are more or less competing with all others in the production of all

commodities. Some products are so bulky, of course, or so perishable, that they cannot very well be transported from one to the other; and various other barriers are interposed to free exchange; but except for these obstacles, all are freely competing, and any country if it is going to produce a given commodity must be in the condition of having a greater advantage over others in its production than in any other of its possible products, or a smaller disadvantage, unless it happens that there is some other commodity which it produces less advantageously which is more in demand in the world. The analysis for any actual country or commodity is the same as for Case VIII, except that more countries and more products are likely to be involved.

The illustrations used are all of comparative advantage as between two or more countries. The analysis would have been exactly the same if areas in any one country had been chosen—for example, New York, Alabama, Missouri, Indiana, North Dakota; or if tracts of land in one area had been chosen—for example, in the area producing fluid milk, cream, apples, strawberries, sweet corn, tomatoes, onions and lettuce for a city market. Each will have tracts in which its advantage over other areas is greatest, and in which it is grown in such amounts as the market will absorb at as good returns as some less favored product might bring.

If the products were timber products or mineral products, the same analysis would apply; or if they were manufactured products. Particular city locations afford their greatest advantages to certain manufactured products—Pittsburgh to steel, Minneapolis to flour, Detroit to automobiles—and these products tend to localize definitely in these places.

As between persons, comparative advantage involves an even more extensive evaluation of alternatives. For most persons there is a considerable number of kinds of work which they might do more or less well; and in any urban community, or larger area, there is nearly always a large assortment of kinds of work which one may do, or train himself to do if he begins early enough. To illustrate this, let us assume five young men who have just finished a college course and are starting out upon a career. Let us assume further that all have had about the same opportunities, and have taken about the same course of training. They will differ in natural ability, and in aptitude for different things. Let the quantities in Case IX be assumed to indicate these aptitudes.

CASE IX

	A	*B*	*C*	*D*	*E*
Factory administration work	40	20	30	20	10
Department store work	25	35	25	30	15
Accounting department work	30	10	10	10	20
Selling bonds	20	50	30	40	30
Newspaper-writing	10	25	20	50	40
Fiction-writing	3	10	5	100	50
Teaching	20	15	15	15	30
Coaching athletics	5	5	40	5	20
Baseball	2	5	60	2	10

These men of course do not know with any precision that they have such a scale of aptitudes for these different lines of work; but they know it roughly, or will discover it in the course of a few years of trying out different jobs. When they do, A will be devoting himself to factory administration work, B to selling bonds, C to professional baseball, and D and F to fiction writing—*if their services are all needed for these particular lines of work.* There may, for example, be an overabundance of persons who can write a fair quality of fiction, or sell bonds with fair success. If so, E may give up fiction-writing, leaving the field to D, and take to newspaper-writing instead. It is apparent that D's advantage over E is much greater in fiction-writing than in newspaper-writing. If there are too many people doing newspaper-writing, then E will surely take up teaching, in which, as a matter of fact, he has a clear advantage over all others. If there are too many baseball players, C may find himself coaching athletics or even selling bonds.

The great mass of the population is of course engaged in doing very ordinary sorts of work—common day labor, retail selling, common factory work. The statement of the principle which best fits their circumstances is in terms of "least disadvantage." In tasks of the next higher grade will be found those who have the greatest advantage over their fellows for such work.

Comparative advantage as between producing units is mostly a matter of area or location, but to some extent a matter of persons also. For example, it may be the aptitude of the merchant that makes a store succeed in a certain location even more than the location itself. The aptitude of a particular farmer for dairying may make a particular farm a dairy farm when all the rest in the neighborhood are beef cattle farms. To the extent, however, that the personnel of a producing unit—the managers, assistant managers, foremen and employees—are fluid and can move from location to location, and all of these very

largely are, it is the location rather than the men that determine comparative advantage of producing units.

The Law of First Choice.—One phase of the principle of comparative advantage is very well covered by a corollary to it that is commonly called the Law of First Choice, which reads as follows: *Any product for which only a limited amount of suitable land is available, relative to the demand for it, will have first choice of this area.* Thus any land which is well suited for growing cotton will be used for growing cotton because cotton is very particular in its climatic requirements and a great deal of it is consumed. The same is true only to a slightly less extent for corn. Coffee is even more particular in its climatic and soil requirements, but coffee is consumed in relatively limited quantities. In consequence there may be considerable fairly good coffee land which is used for some other crop. Sugar beets have an abundance of land which is well suited to their culture, and likewise potatoes, in each case relative to the demand for them.

The same principle can be stated in terms of locations or persons with only a slight change in the wording. In the matter of factory locations, there is a limited number of areas in which a coal and iron supply are close to each other; and consequently any location of this kind is likely to be used for steel manufacturing. In most cities, there is a limited area which is near to the railway and water terminals and also to the main retailing district. Consequently such territory is sure to be used for wholesaling, cold storage and the like. As applied to persons, there are relatively few people who sing really well, or talk really well, and hence those who do are surely to be found doing these things.

The Law of First Choice does not cover all the ground covered by the Principle of Comparative Advantage—in particular it does not provide for the numerous situations in which a large number of more or less fit persons or areas or locations are available and the problem is one of determining which one of these has comparative advantage. But as far as it goes, it is very helpful in analyzing situations, and should therefore be thoroughly comprehended. It is properly called a corollary of the other principle because it grows out of it or is a deduction or inference from it.

Common Interpretations of the Principle of Comparative Advantage.—There is a very simple rule or procedure commonly followed by the man on the street which brings him completely into line with this principle. It is as follows: *Buy anything which you can buy more*

cheaply than you can produce it. If the man is a manufacturer debating whether to buy his power or produce it, he decides the question on the basis of which costs him the less. If he is a retail meat dealer in a country town debating the question whether to slaughter his own beeves or buy from the packers, he decides upon the basis of which costs him the less, similar quality being assumed. In so doing, these men are simply following the principle of comparative advantage, concentrating their effort upon those things in which their advantage over others is greatest. By buying his power, the manufacturer can turn out more product with the same investment of capital and labor; by buying his hay, the farmer can grow more cotton. The manufacturer can buy the power more cheaply than he can produce it because others have a greater advantage than he, or a less disadvantage, in producing power.

This may be illustrated by reference to a variation from Case V.

CASE X

	A	*B*	
Buy power	40	30	= 70
Produce power	36	32	= 68

Two manufacturers producing the same commodity have the choice of buying or producing the power used. Manufacturer A has an advantage over B in both methods of production, but buying his power, A's advantage is greater than if he produces it. B, working at a disadvantage in either case will select the method which gives him the least disadvantage. This will be if he produces his own power. The ratio of 32 to 40 is greater than the ratio of 30 to 40; thus the production of power will enable B to compete with A on a more nearly equal basis.

In the above form, the rule is really a rule for producing units. The rule stated for persons would be as follows: *Hire those things done which you can hire done more cheaply than you can do them yourself.* Have your shoes polished if the time or effort thus saved is worth more to you than the money it costs to hire them polished.

Applied to a community consisting of a city and surrounding area, the rule would work out as follows: The city would import any supplies or products from other areas which it could buy more cheaply than it could produce them. Thus it would import most of its early vegetables, because it is cheaper to do so than to grow them in greenhouses at home. It might import milk from areas a hundred miles

away for the reason that it cost more to produce the milk in the home area than it could be bought for elsewhere, including transportation costs, the land near by having a greater advantage over the outside areas in small fruits and vegetables than in milk.

Applied to a country, the rule would be that each country would import any product that it could buy more cheaply abroad than it could produce it. Thus the United States would buy most of its wool, sugar and flax abroad instead of trying to produce most of them as at present.

Every time a job is done in accordance with the principle of comparative advantage, it is done economically,—other things being the same, with the lowest possible expenditure of human effort and natural resources. Every time it is done not in accordance with this principle, human or natural resources are wasted. A person trying to do a thing for which he is not fitted is surely wasting effort, unless it should happen that there is no one better fitted available. A person doing a thing which many others might do in his stead, when he is badly needed for a task which is short of men, is surely wasting human energy. A society, therefore, in which each person is working in accordance with the principle of comparative advantage, other things being the same, is therefore a productive society. All the available human energy in it is assigned to tasks in such a way as to secure the maximum output from all. Public policy should therefore concern itself with securing the freest possible working of the principle of comparative advantage.

Although business men and others regularly and consistently apply the rule in their own private business affairs, they sometimes deliberately take a position opposed to it if the issue involves a city or community, and they very frequently take an opposite position if the issue involves a whole country. Yet there is no difference between the three cases. The rule is the same for all three. Any country which fails to operate according to the principle of comparative advantage, which forces its people to produce things themselves that they could buy more cheaply abroad, is forcing a serious loss upon them.

SUGGESTIONS FOR FURTHER READING

Further discussion of the principle of comparative advantage may be found in F. M. Taylor's *Principles of Economics* (1921), Chapters XVI and XVII, and in F. W. Taussig's *Principles of Economics* (1921), Vol. I, Chapters 33 and 34.

C. E. Griffin's *Principles of Foreign Trade* (1924), Chapters I, II, III and IV, and F. W. Taussig's *Free Trade, the Tariff and Reciprocity* (1920), Chapters IV and V, also present additional material on the subject. An earlier treatment of the subject is given in John Stuart Mill's *Principles of Economics*, Book II, Chapters XVII and XVIII.

PROBLEMS

1. To what extent and in what form was there specialization in each of the stages of economic development?
2. Has specialization come about through conscious effort?
3. A young dentist finds that he makes three times as much per hour fixing teeth as in cleaning teeth, but he has to do both in order to get patrons. Half of his time is now spent at each task. If he hired a dental nurse to do the cleaning work, they would both be busy only three-fourths of the time. Would it pay him to hire a nurse?
4. Assume the following situation:

	Minnesota	*Pennsylvania*
Iron ore	60	40
Steel rails	20	60

The numbers represent the productivity of one production unit when employed at the work indicated in the two states. Determine:

a. The total product of iron ore and steel rails if there is no specialization.
b. The value of each commodity in terms of the other in each state.
c. In which product each state will specialize. Reasons.
d. Assuming no transportation costs, how much Minnesota will gain per ton of iron ore by specializing in the production of iron ore and shipping it to Pennsylvania in exchange for steel rails.
e. Under the same assumptions, how much Pennsylvania will gain per ton of steel rails by specialization in the production of steel rails and by trading them for Minnesota's iron ore.
f. What will be the total production of each commodity assuming complete specialization.
g. What will be the gain in the total amount of each product.
h. Assuming that no more iron ore is needed than is now produced and that it is produced in Minnesota, how much productive effort will be required to produce that amount of iron ore.
i. Assuming that no more steel rails are needed than are now produced and that they are produced in Pennsylvania: how much productive effort will be required to produce that amount of steel rails.
j. How much productive effort would be required to produce all the steel rails needed if made in Minnesota.
k. What would be the saving in productive effort if the total steel rail production were transferred to Pennsylvania if formerly it had been carried on in Minnesota.

l. How much productive effort would be required for Pennsylvania to produce all the iron ore needed.
m. What would be the saving in productive effort if the total iron ore production were transferred to Minnesota if formerly it had all been produced in Pennsylvania.
n. Assuming that Minnesota produces all the iron ore now required and Pennsylvania all the steel rails now required, how much productive effort will be free for other production in each state.
o. Assuming that the same amount of iron ore is needed as is now produced and that it is all produced in Minnesota, how much steel rails could be produced if the balance of productive power in Minnesota and all the productive power in Pennsylvania were utilized in steel rail production.
p. What would be the gain in steel rail production over the total production before specialization.
q. Assuming that the same amount of steel rails is needed as is now produced and that all of it will be produced in Pennsylvania, how much iron ore could be produced in both states, all of the available productive power being so utilized.
r. What would be the gain in iron ore tonnage over the production before specialization.

5. A foreigner visiting an American farm observed that the farmer sold his pigs in the market and then bought cured ham, paying four times as much per pound for it as he received for the live animals. The foreigner exclaimed: "How very extravagant! In Europe we kill our own hogs and cure our own ham." Was this farmer extravagant? Explain fully.

6.

	Great Britain	*United States*
Cloth	40	40
Cotton	20	60

a. In which commodity would each country specialize? Why?
b. What would be the gain in each commodity, assuming complete specialization?
c. Assume that the productive effort saved by specialization will be used to increase the production of both commodities in the same proportion as they are now being produced: how much more of each good will be made?
d. How much productive effort will go into the production of each in the United States?

7.

	United States	*Germany*
Coal	30	28
Copper	24	16

a. In what commodity would each country specialize? Why?
b. Would the United States produce some of both commodities? Why?
c. Assuming that the same amount of copper is wanted as is now produced, what would be the total coal production of the two countries, the balance of the energy being used in coal production?

d. Assuming that the same amount of coal is wanted as is now produced, how much productive energy would be released for copper production in the United States.
e. How much copper would be produced?
f. How much coal would be gained under No. 3 above?
g. How much copper would be gained under No. 5 above?

8. Three countries, A, B, and C, produce three commodities, x, y, and z, with the following efficiencies:

	A	*B*	*C*
x	2	4	8
y	4	8	2
z	8	2	4

What will each produce? How many units of each commodity will be gained from specialization?

9.

	Country A	*Country B*	*Country C*
Wheat	2	6	6
Corn	8	6	8
Cotton	6	8	10

In the production of which commodity will each country tend to specialize? How much will be gained from specialization?

10.

	Country A	*Country B*	*Country C*
Lumber	12	10	9
Cutlery	10	6	8

In the production of which commodity will each tend to specialize? What will be the gain by specialization? Will Country C produce both commodities? In which will it tend to specialize most? Why?

11. When America trades with uncivilized countries, is it possible for her to obtain goods for less effort and time than it took the natives to produce them?
a. Prove your answer by using assumed numbers.
b. Would this be exploiting the natives?

12. Suppose that with one unit of productive effort the United States produces 10 pounds of pork and 30 pounds of sugar, and Cuba only 2 pounds of pork and 20 pounds of sugar. How much will be gained by carrying on trade?

13. If in the above problem Cuba could produce (a) 8 pounds of pork and 24 of sugar, how much would be gained by trade? (b) 10 pounds of pork and 60 pounds of sugar, how much would a pound of each in terms of the other be worth in each country?

14. Once upon a time, certain people in this country started propaganda to stop us from buying anything made in Germany. Would Germany lose by this? Would we?

15.

	Country A	*Country B*	*Country C*
x	42	28	35
y	18	12	15

a. Will there be specialization under these conditions? Why?
b. The relationships involved here are similar to those in which case mentioned in the text?

16. Use your own assumptions as to countries, products, productivity, etc., and make up problems illustrating each of the first seven cases mentioned in the text.
17. Indicate, by drawing a circle around the number, where specialization will take place in each of your illustrations in No. 16.
18. Explain fully the meaning of "least disadvantage."
19. Use the following table, but make your own assumptions as to areas, countries, persons, products, kind of work, demand, supply, etc.; and show how specialization would take place. State your assumptions and show your method of analysis step by step.

	A	*B*	*C*	*D*	*E*
V	50	45	50	20	20
W	45	40	40	15	25
X	40	35	30	35	20
Y	35	30	60	30	15
Z	30	25	55	25	10

CHAPTER VI

SPECIALIZATION BY OCCUPATIONS AND TASKS

The federal census of 1920 assigned each of the 41,614,248 persons 10 years of age or over gainfully employed in the United States to one occupation and one only. They had great difficulty, of course, in determining in which category to put many people; for example, whether to call certain persons bankers or real estate agents, whether to call certain other persons students or book agents, and whether to call certain other persons woodcutters, farm laborers or railroad laborers, because they were all three intermittently. And no doubt they made many mistakes. But the significant thing is that they actually undertook to make such a classification; for they surely would not have done so were we not highly specialized as persons in our economic life.

One of the difficulties of working out a classification by occupations is that occupations are constantly becoming more and more specialized. Not so many generations ago our shoes were made in small shops or by itinerant cobblers who traveled from house to house and handled the whole job from beginning to end just as many dressmakers still do to-day. In a modern factory, the making of shoes and clothing is split up into a larger number of small simple tasks. What this minute subdivision of tasks is like may be judged from the following account of cigar-making, one of the simplest of manufacturing processes: [1]

"The first grade of skill in cigar factories includes superintendents and foremen of all kinds, selectors or wrappers, all-around cigarmakers, bunchmakers, retailers, and packers; the second grade, strippers, casers, bookers, dryers, stockmen, fillermen, pressmen, and branding-machine operators; and the third grade includes head banders, labelers, and posters.

"In superintendence, a large cigar factory has its general or factory foreman, and its foreman or forewoman and assistant foreman or assistant forewoman for each department and room, and for nearly every process.

"Machinists are sometimes employed as part of the regular force to repair

[1] *Twelfth Census of the U. S.*, Special Report on Employees and Wages, p. 1190.

the machinery. Laborers, general hands, helpers, and boys and girls, who, however they may be classified, are used in part for messenger and carrier service in and between the departments, are found in cigar as in other factories.

"Casers open bales and remove the tobacco; they then dip it in water to moisten it, withdrawing it again immediately.

"Strippers or stemmers take hold of the stem near the point of the leaf, and strip it from the leaf, which splits off readily. Strippers are divided into wrapper strippers, binder strippers, and filler strippers. The wrapper strippers are among the most skillful, great care and delicacy of touch being required in order to avoid tearing the thin and friable leaf; the binder stripping requires somewhat less skill, and filler stripping least of all, since the leaf of the filling may be torn without impairing its value.

"Bookers or book wrappers spread the leaves out perfectly smooth over a semicircular block and lay the stripped leaves one upon another in the form of a book or pad. The tobacco goes to the cigar-maker or roller in this form, so that he has no straightening out to do, but sees at once the exact size and form of each leaf.

"A wrapper selector or classer, or shader, sorts the wrappers into classes to be given to the makers of the various grades of cigars. A dryer takes from the strippers the tobacco intended for filler and spreads it out on the floor of the drying room. When it has been dried to the proper degree, it is gathered into bins in the stock room, where a stockman gives it out to the cigar-makers as required, charging each man with the amount he receives. When one man takes charge of and gives out the filler, he is called the filler-man.

"Cigars are made either by the all-hand or by the part-machine process. The hand cigar-maker rolls the filler into a bunch in his hand, puts a binder around it, cuts the wrapper into the proper shape, and wraps it neatly around the bunch. One end is fastened by being tucked in as the wrapping begins, while the other end is brought to a point and a little gum tragacanth applied to hold it together. The end at which the wrapping started is then cut off square.

"In the part-machine process, a bunch-maker makes the bunch and wraps the binder loosely around it; a pressman puts this into a wooden form and presses it into shape, and a roller puts on the wrapper and finishes the cigar just as in the first process. Both the bunch-maker and the roller are also called cigar-makers.

"The foreman inspects the cigars as they leave the cigar-makers. A branding machine operator then puts them through a machine in which a metal stamp, heated by gas, impresses a name or trademark on the cigar.

"Sometimes head banders or taggers paste around each cigar a paper band bearing a trademark or name.

"Before putting the cigars in the boxes, the packer sorts them carefully according to the color and shade of the wrapper, in order that all in a box shall be alike.

"Labelers and pasters paste on the labels, stamp or stencil on the box the name and color, and attach and cancel the revenue stamps.

"A pouch-maker makes the pouches in which tobacco is sometimes packed."

The following paragraphs from a similar account of shoe-manufacturing show what specialization by tasks is like in a more involved manufacturing process: [1]

"Occupations of the greatest skill in shoe factories are those of foremen, overseers, and other headmen and their assistants in the different departments and processes, and also cutters, stock sorters, Goodyear welters, rough rounders, edge trimmers, and operatives doing the same grade of work. In the second grade are skivers, closers, seam rubbers, gore and gusset seamers, top stitchers or corders, fancy stitchers, rounders, edgers, heel compressors, shankers, fair stitchers, prick stitchers, bottom finishers, ironers, pegging-machine operators, and the like. The third grade embraces punchers, eyeleters, hookers, perforators, tip fixers, table workers, stock wetters, channel cementers, machine loaders, edge blackers, stringers, and similar occupations.

"Superintendence is divided as in other industries; there are foremen and assistants, overseers and headmen for the various departments, rooms, machines, and processes, and floorwalkers and the like.

"Carpenters, machinists, painters, etc., are occupied in repairing buildings and machinery. General helpers in the factories are designated as lumpers, off-bearers, utility hands, last pickers, etc.

"Boys are employed to help and carry, with such designations as dinker boys, last boys, helper boys, taker-off boys, and packer boys.

"The occupations are described, by rooms, in the following order: The cutting room, where the parts which form the uppers are cut out; the fitting room, often called the stitching room, where these parts are stitched together to form a complete upper; the sole-leather room, where the parts which form the bottom of a shoe are cut; the making or bottoming room, where the bottoms are joined to the uppers and the shoes are bottomed or made; the bottom-finishing room, where the bottoms of the shoes are finished; and the upper-finishing and packing room, where the uppers are finished and the shoes packed."

[1] *Twelfth Census of the U. S.*, Special Report on Employees and Wages, pp. 1198–1201.

In the description of cigar-manufacturing are listed 30 different "tasks" or "occupations," to use the census designation. The analysis of shoe-manufacturing lists over a hundred different tasks. Not all of these tasks, however, are performed in every factory. For example, some are performed only on button shoes; some represent work with different machines, such as with Goodyear stitchers or with McKay stitchers, which are substitutes for each other; and some are general names for a group of tasks, such as "bottoming," "finishing," which are also given in detail. Thus there are six different kinds of finishers. But even allowing for these alternatives and duplications, there are over seventy different tasks represented in the process of shoe manufacturing. The census descriptions for certain other industries show numbers of tasks as follows: iron and steel, 211; clothing, 92; flour milling, 73; brewing, 49; baking, 31.

If we examine in more detail the two descriptions given above, we will find that the workers can be separated into groups. The first separation is that between labor and management. Every plant has at least one person who devotes most of his time to management, and most of them have a considerable staff of superintendents, foremen, overseers, bosses, floorwalkers, and the like. Each of these may have his assistant, or first and second assistants. The division of superintendence may be carried down to sections or rooms, as in cotton mills, each section having its section boss.[1]

Another way of classifying the tasks is upon the basis of the amount of skill or judgment required. The shoe workers, for example, are put in three groups on this basis, the first including stock sorters, cutters, welters, and trimmers; the second, the skivers, seamers, stitchers and the like; and the third the operators of the simpler machines, such as punchers, eyeleters, hookers, and the like, and the performers of the simpler hand operations, such as loading machines, blacking, stringing laces, wetting stock, etc. The first class of tasks calls for a good deal of judgment as well as skill; the second, mostly for skill, and the third mostly for dexterity.

Another way of classifying the tasks is according to the amount of equipment used. Some of the tasks are performed by hand with no machines or tools of any kind, or with very simple tools; others are hand-tool tasks; and the rest are machine tasks. In shoe-making, most of the tasks require tools or machines; in cigar-making, very few.

It is to be noted that some of the labor is not directly upon the

[1] *Twelfth Census of the U. S.*, Special Report on Employees and Wages, p. 1171

shoes, but with the materials and supplies used in making the shoe, or upon the machinery and plant. Some of these tasks are of a general sort and performed in plants of many descriptions; such, for example, as carpentering, blacksmithing, running errands, carrying supplies, and loading machines. Similarly, some of the tasks have to do with the packing of the product, labeling of the cartons and the like.

The two foregoing accounts omit entirely the large group probably employed in the selling department; and the group oftentimes nearly as large engaged in keeping the records and accounts. They are left out because selling and bookkeeping are not operations confined especially to cigar-making and shoe-making. Selling is much the same regardless of the commodity sold; and so with record and account keeping.

It may be well at this point to distinguish between an *occupation* and a *task*. There really is no hard and fast distinction between these. In general a task is a particular part of a production process, frequently a single operation. Occupation is in general the larger term. Teaching, carpentering and farming are clearly occupations,—at least, no one would designate them as tasks. However, to list all persons engaged in many plants as of one occupation will not do either. The bookkeeper and the booker in a cigar factory are clearly of different occupations; also the messenger boys and the bunch-makers. Thus many workers properly of different occupational classifications may be associated in one factory, or shop, or farm, or store. The U. S. Census Bureau is increasingly following the practice of designating tasks as occupations; but general usage is not likely to accept the practice—people will undoubtedly continue to designate all cigar-making work as one occupation.

Whether specialization in any given case is looked upon as by occupations or by tasks, it is always specialization by persons, and it is as specialization by persons that it will be analyzed mostly in the rest of this chapter.

I. BASES OF COMPARATIVE ADVANTAGE IN SPECIALIZATION BY PERSONS

Any discussion of comparative advantage should consider first the things that determine the particular kind of comparative advantage in question.

The principle of comparative advantage as applied to both individuals and areas is based upon two sets of considerations, the *internal*

considerations, or those pertaining to the individuals or areas themselves, and the *external* considerations, first of which are those of supply and demand—in the case of persons, of supply of persons available or fit for a given task, and of demand for the product resulting from that task. We shall also see later how the operation of the principle is affected by the supply and types of other production elements available, of tools, machines, buildings, land, etc.

Internal Factors.—Let us take up the internal considerations first. These are the differences between individuals. Individuals differ physically, mentally and morally. The physical differences are not mere differences in stature, weight and muscular strength—they include differences in quickness of movement, dexterity, automaticity, endurance, etc.; differences in eyesight and hearing, in speaking voice, in personal appearance, in poise and presence. The mental differences one thinks of first are the differences in quickness of perception, in memory, in imagination, in reasoning powers and in soundness of judgment. The most significant moral differences are those pertaining to honesty and uprightness, faithfulness to trust, steadfastness of purpose, and courage. All of these differences determine fitness for tasks and callings. The same person cannot very well excel both as a hodcarrier and a typist. The good salesman seldom makes a good research worker; and vice versa. Perhaps a few store managers would make good floorwalkers; but seldom would a good floorwalker make a good store manager.

These differences between individuals arise in various ways. First of all, they are inherited physically from one's forbears. This is true of a good part of mental as well as physical differences. Secondly, they are inherited socially from one's environment especially during childhood and early youth. There is, of course, the long-standing never-answered query as to which is more important in determining one's characteristics, inheritance or environment. We do not need an answer to it here, at least not a very definite answer. It is probably enough to know that both have an important influence. Perhaps the ordinary person gives too much weight to physical heredity, not realizing that he himself probably owes to early home and neighborhood associations many of the characteristics which he attributes to direct physical inheritance.

A third source of individual difference is training received in the schools or as apprentices. By such means, we consciously set out to make ourselves different, some to acquire the manual dexterity of

handicraftsmen, artists, draftsmen, architects; some to acquire skill in public speaking, others in writing, others in teaching, others in diagnosing human ailments and treating them, others as accountants or statisticians. Part of education is very general and does not fit for any particular walk of life; but even this increases the differences between individuals because those with the best natural ability respond to it the most.

The fourth and last source of individual differences is experience on the job. Men are made over much more by their occupations than by any special training which they receive in advance. Many occupations unfit men for most other occupations. One who has been a factory worker all his life is not likely to succeed afterwards as a farmer. On the other hand, few farmers afterwards succeed as storekeepers. It is proverbial that college professors are seldom good for anything else afterwards. The statement is equally true, however, of salesmen, bookkeepers and government clerks. But while they are becoming unfitted for other tasks, up to a certain point at least they are becoming better fitted for what they are now doing. They are becoming more dexterous with their hands and more automatic in the performance of their task, or are learning more about their business. Who but an experienced surgeon could remove an appendix in fifteen minutes?

External Factors.—Of the considerations external to the individual determining comparative advantage, the supply of "fitness for the task" in proportion to the need or demand for the product of it is the most important. As already pointed out, it is not enough that one be better fitted for a given task than for anything else—it may be that there will be so many others in the same condition that it will be better for him to do something which he does less well. It perhaps would be a good thing for the world in some ways if consumption could be arranged so that we could let each person do what he can do best, and manage somehow to dispose of the product. But unfortunately we do not choose what we will consume solely on the basis of the ease with which it can be produced. Hence we must choose our occupations according to what the world wants, not according to our own preferences, if we expect to be well paid for our services. Of similar order is the need, also already pointed out, of at times not even doing the thing that we can do better than anybody else, merely because our services are more needed for doing something else for which the supply of "fitness for the task" is limited relative to the need for it.

Comparative advantage is also determined in many cases by the supply of special capacities and efficiencies of the other elements of production which are available for use by the individual. Equipped with good machinery, tools and factory buildings, the workers in one region may have the advantage over others with more personal fitness but with poorer equipment in the same line of production in other regions. Natural resources count heavily in such competition. It may be the presence of a good water power that gives the advantage to one area; or more fertile land; or a better climate. In competition between individuals, sometimes it is the man with the best tools rather than most ability who has the advantage over his fellows; or the man with the most capital or with the most fit soil. The playing of the best violinists is in no small measure due to the quality of their instruments. Sometimes it is the coach who is more responsible for the playing of a star football player than the man himself—or sometimes the other players in the team who give him his opportunity by holding the line firm and giving him good interference.

Specialization as between persons would never have developed as it has if new methods of production and new forms of business organization had not accompanied it. In particular, it owes a great deal to the increased use of machines and power in production.

II. GAINS FROM SPECIALIZATION BY PERSONS

Let us now examine the workings of specialization by occupations and tasks in somewhat more detail, taking up first some of the more desirable aspects of it, and then the undesirable aspects.

Matching Individuals and Occupations and Tasks.—Individuals become fitted to occupations or tasks both by being selected properly for them and by being adapted to fit them after undertaking them. No doubt a considerable part of the fitting is due to the former. No amount of training and exercise will give some men the necessary strength for heavy manual work. Only a few men in a thousand in spite of any amount of training can be made to run a hundred yards in ten seconds. No amount of training will enable a person of third-rate mind to become a good engineer, journalist or research specialist. A slow thinking person, no matter how profound his ultimate thoughts may be, will never make a good prosecuting attorney. Neither will a person with a poor memory ever make a good railway information clerk. Specialization permits the selecting of the right persons for the right occupations. It not only permits it, but

it largely achieves it. There are, of course, at any one time many men not doing the work at which they have comparative advantage, and no doubt some who never will find such work. But in a society as competitive as modern America, the misfits are reduced to a relatively low figure. It is in stratified societies where individuals are rigidly bound in certain castes, as in India, that the misfits are most numerous.

The possibilities of choosing individuals according to tasks have been very greatly increased by the high degree of division of labor which has been developed in modern factories. When a process is broken into small operations, the requirements of each operation can be studied carefully and men can be fitted to them. Some will require muscular strength mostly; others, deftness; others, automaticity; others, good eyesight; others, judgment; or some particular combination of any two or more of these. It is much easier to find persons who qualify well in one or two particulars than in a half-dozen. It is frequently possible even to find work for many persons who are physically defective. For example, some of the minute operations of a modern factory can be performed by persons with one arm, or without legs, or who are deaf or blind. Eventually, division of labor of this sort is going to provide a useful occupation for all our physical defectives, so that even our beggars can be banished from the streets.

In fact, a breaking up of processes into simple, easy operations makes it possible for persons with very ordinary natural ability to do many of them. Almost anyone, for example, can learn to perform the operations of reaching for a piece of leather, inserting it into a definite place in a machine, and pressing down on a foot-lever, even though it is necessary that the hole be punched very exactly. The man who splits carcasses into halves in a meat packing plant or fastens hair springs in watches has to be highly skillful; but these operations are so restricted in scope that a person of very ordinary ability may be able to learn them. Also breaking a task into small parts may reduce the amount of skill that is required of one person because it saves him from looking after and handling a number of operations simultaneously. One must not get the impression from this that there is any reduction in the total amount of skill required—it is merely divided between more persons.

In fact, there is likely to be associated with the minute subdivision of tasks a speeding up of operations that considerably increases the total demand for skill. Much more skill is required to insert a screw

into a watch frame in one second than in two. Moreover, after every possible subdivision of skill has been made, there still remain some tasks requiring a large amount of it. Then there are many tasks requiring a high degree of *judgment* as distinguished from skill. The selecting of stock can never be done by machinery. Neither can designing and drafting, or setting up page forms in printing. The substitution of machines for hand labor in many cases increases the demand for both skill and judgment. For example, more skill and judgment are required to operate a lineotype machine than to set type by hand; to operate a machine for cutting the leather for a pair of shoes more than to cut it by hand. The man who operates the levers that determine into what dimensions a log shall be sawed needs vastly more judgment than the men who sawed lumber in the days before machine sawing was developed. However, the number of tasks of this kind is considerably reduced relative to the total amount of work to be done, so that able well-qualified men can generally be found for all such tasks that remain. Also such ability is made considerably more productive because it has machinery to use, and because it is supplemented at every hand by less skilled labor. The great gain is that it provides an economical way of using ordinary ability, of which there is such an abundance in the world. Those who can use workers of ordinary ability get their work done cheaply on the one hand; and on the other, make such workers more productive and enable them to earn better wages than they otherwise would.

Of equal importance is it that the necessary skill for these minute operations can be acquired in a short time. This makes it possible to develop a substitute quickly if the regular workman fails to report for duty, and for a worker to shift from factory to factory with little loss of pay or inconvenience. The new worker in many cases is about as valuable at the end of the second or third week as he is a year later. This mobility of labor is a great advantage in most respects; but in others not, as will be discussed later.

The Adaptation of the Individual.—When the individual is highly specialized in his work, he is normally *doing only one thing* from morning to night day after day. This *one thing*, however, may either be very simple, like shoveling sand into a hopper, or it may be as multiform as the day's work of a country doctor who may treat a dozen different ailments in one day, including perhaps a minor operation or two; or it may be any gradation between these two extremes. But in all forms of specialization, no matter how

varied the activities included, there is a considerable amount of *repetition*. If the same thing is not done over and over again, as in the game of pitching horseshoes, the same thing is done over again in practically the same form at intervals, as in the game of golf. When physical movements are repeated frequently, the first thing that happens is that they are done with more ease and more precision, and the second is that they are done with little or no attention given to them—the movement becomes automatic wholly or in part, like walking or dancing. The simpler the task, the more dexterity, precision and speed that can be developed. An experienced tobacco stemmer is able to remove the stems from several times as much tobacco in a day as a green hand, and will tear fewer leaves by far while doing it. The eyelet-row stitcher will stitch many more uppers in a day after she has worked for a few months than will a new hand; and will do more stitching in a day working only on eyelet rows than she would if she stitched the whole upper. The third thing that happens is that the human body becomes adapted to the doing of the thing. If it is an act that requires strength like carrying pig iron into a car, the body becomes stronger; if it requires speed, like typewriting, the fingers become nimble; if it requires precision, like shooting, the movements become more accurate and better timed. Lastly, the individual's endurance is better, because he is stronger and because he makes no false motions. For all these reasons, the job is better done and with less effort. A considerable part of the effort saved is nervous effort, that is, the effort of attention that must be given to the details of the operation. Even the eyes are saved when it is no longer necessary to watch the movement of the hands so closely. The operation presently requires very little attention to be given to it. The eye may have to follow every movement, but not the mind.

This may have two consequences. One is that the worker will have time to think about other things than his work, or will be so fresh in mind at the end of his day's work that he can do a good deal of thinking to good effect on other problems. John Stuart Mill even went so far as to say that the work that he did at his office in the British Indian service did not interfere much with his thinking and writing when he reached home. Alfred Marshall, however, thinks that Mill went too far in this statement. The other consequence is that much more difficult operations can be undertaken. With the mind relieved of the details of the steps, the dancer may carry on a spirited conversation with his dancing partner. With his mind relieved of the details

of sentence construction, the lecturer may spend his mental energy in developing his thoughts clearly and logically. Many of the operations performed in modern industry call for an amazing amount of skill and precision. They are possible only because the operation has been simplified to a point where the basic elements in it are executed automatically, leaving the mind free to concentrate on the more difficult phases of it.

It is but a step from physical movement of the kind just described to the simplest forms of mental activity. Mental activity is just as much a matter of physiology as physical activity. With repetition, there is the same habit forming, the same development of automaticity. When one starts in writing, one forms each letter consciously. Later, one merely thinks the word, or perhaps merely the idea, and the mind spells the word and the hand forms the letters unconsciously. The operations of adding, multiplying and the like become almost completely unconscious in time. When this stage is reached, they are done with ease and without mistakes.

Even operations more complicated in their nature, such as lecturing, become partly unconscious. The lecturer thinks the ideas which he wishes to express, and in large part the diction and sentence structure take care of themselves. Even the paragraphing takes care of itself in large part. Especially is this the case if the subject is one upon which the lecturer has talked several times before, or upon which he has made careful preparation in advance. The more practice one has in lecturing, the better one is likely to lecture, for the reason that one's ideas take shape more readily, in a better choice of words, and in better sentence and paragraph structure. Also the easier will the lecturer find the task.

Operations like written composition ordinarily have less of the automatic in them than lecturing, for the reason that the ideas that are being expressed are usually being thought out exactly for the first time. There is, then, in written composition, a large amount of actual *thinking*—and thinking by definition can never be automatic, although, as a matter of fact, there is likely to be involved in each idea or relationship conceived a good deal of retracing of familiar ground.

What is true of written composition is equally as true of such activities as planning operations, deciding policies, supervising men—the activities that constitute the executive function.

But although there is little of simple repetition in such activities as planning and the like, there is a good deal that partakes somewhat

of its nature. It at least can be said that the individual is doing the same sort of thing over and over, like the portrait painter, for example. No two faces which he paints are exactly alike; and yet the movements of his hands vary but little from one brush-stroke to another. The attention can never relax, as in simple automatic movements, but there is the same opportunity for development of deftness and accuracy. So it is with the business executive—although no two business situations are likely to be exactly the same, they are sure to have much in common, so that experience in the handling of one helps in the handling of all that follow. So even is it with the process of thinking. The thinker acquires an ever-increasing store of ideas all interwoven with each other, making ever easier the formulating of still other ideas.

Even of more importance than the foregoing is the knowledge or wisdom one acquires from such experience. The shoe merchant constantly learns more facts about leather and shoe construction. A good stenographer becomes a better speller each year—at least until she reaches the age of uncertainty. The architect constantly learns more facts about building materials. A manager learns by experience that certain policies or procedures are fraught with certain dangers or are likely to meet with certain obstacles.

Substitution of Machines for Hand Labor.—Specialization permits a greater substitution of machines for hand labor. Any mechanical process however complicated can be performed by machinery if it can be divided into simple enough operations.

But specialization by tasks developed in the first place on the basis of a better adaptation and utilization of human labor. The economist Alfred Marshall illustrates this by the watch-making industry.[1]

"Some years ago the chief seat of this business was in French Switzerland; where the subdivision of labour was carried far, though a great part of the work was done by a more or less scattered population. There were about fifty distinct branches of trade each of which did one small part of the work. In almost all of them a highly specialized manual skill was required, but very little judgment; the earnings were generally low, because the trade had been established too long for those in it to have anything like a monopoly, and there was no difficulty in bringing up to it any child with ordinary intelligence. But this industry is now yielding ground to the American system of making watches by machinery, which requires very little specialized manual skill. In fact the machinery is becoming every year more and more automatic, and is getting to require less and less assistance from the human hand."

[1] *Principles of Economics*, p. 257.

Thus in the watch-making industry in Switzerland, it was discovered long before the days of machine manufacture that subdividing a manufacturing process into small parts was highly advantageous. Each worker was able to attain a high degree of skill, and in consequence do more and better work. A similar story might be told for many other industries, for example, for the metal trades and the textile industry. But no sooner were the advantages of this generally realized than machines began to be introduced to perform some of the simpler or more monotonous or disagreeable of the operations. It was found that simple operations could be done as well by machinery as by hand, and with much less effort. About this time, steam power came into general use and hastened the development. We would have had a great deal of specialization by tasks without any increase in the use of machinery; we would have had considerable use of machinery without specialization by tasks; but the two working together caused a great increase in both, and more especially in the substitution of machinery for hand labor.

This tendency is still under full head. Each year sees new operations, new whole manufacturing processes, reduced to a machine basis. Some of the most difficult undertakings of this sort are in the field of agriculture. But the inventors are constantly at work. The most recent developments are the milking machine, the corn-picking machine, the cotton-picking machine and the flax-breaking machine. None of these is perfected at the present time, and two of them are far from it; but it is safe to predict that eventually most of the major difficulties will be circumvented.

It does not, of course, go without saying that using a machine is always more economical than doing the work by hand. For example, it is doubtful if it would pay many householders to use a power lawn-mower; or many housewives to use dish-washing machines. But it probably does pay many housewives to use clothes-washing machines. Similar questions arise with respect to many factory operations. Some cigar factories use machines for some of the operations; some use no machines whatever. In general, however, the substitution of machines for hand labor offers many important advantages. Some of these advantages are the following:

a. Much more power can be brought to bear with a machine than can ordinarily be applied by hand or even horse labor. The tremendous pressures of the rolls in a steel-rolling mill, in a flour mill, or in an oil-crushing mill, are examples of this. Not only can the pressure

be brought to bear, but it can be controlled. Professor T. N. Carver speaks of machines being made so as to "control working parts which are themselves too large and heavy to be guided by human muscles. No human hand could guide the rollers in a steel-rolling mill, to say nothing about driving them. They are held in place and controlled by a powerful framework and, with the stupendous power which they have behind them, can perform gigantic feats." [1]

b. Machines can be driven at much greater speed than hand labor can attain. The printing press is an example of this.

c. This substitution of mechanical power for human effort is a tremendous saving of human energy. In general, it is the heaviest or most disagreeable operations that have been taken over by machines first. Alfred Marshall uses house carpenters as an example of this. Before the days of sawmills and planing mills, lumber was sawed out largely by hand and planed with jack-planes. "The jack-plane," says Marshall, "used for making smooth the large boards for floors and other purposes, used to cause heart disease, making carpenters as a rule old men before they were forty." [2]

d. Machine operations attain a higher degree of precision than hand operations; and they do it with vastly more facility. A modern machine will manufacture a million automobile crank shafts all exactly alike, so that a new one can be substituted for the old one at any time the old one breaks or wears out; or so that any crank shaft may be taken from a pile and combined with any one of the proper gears from other piles, and assembled into a perfectly fitting transmission mechanism. This great advantage of machine manufacture is one which is so familiar to us that we scarcely even think about it. It is this precision of machinery which makes possible the perfectly matched lumber of our dwellings and even of most modern furniture. If hand labor in the old days did achieve perfectly fitting joints, it was at very great expenditure of time and waste of materials. It is as easy for a properly constructed machine to produce a perfect fit as an imperfect one; and it will ordinarily do it in the same length of time.

Not only have machines been developed to take the place of hand labor for by far the larger part of the work done in a modern factory, but these machines have constantly been made more efficient in the use of what labor they still need. The very development of the machinery is partly one of the results of specialization. If men had

[1] *Principles of Economics*, p. 262. [2] *Principles of Economics*, p. 341 (1898).

not concentrated upon the manufacture of one or two things, most of this progress would not have been made.

Think of the special machines and devices that have been developed for the manufacturing of each of the numerous parts that make up a watch or an automobile.

Adaptation of Tools.—Specialization by tasks permits a high degree of adaptation of hand tools as well as of machines; also of supply materials. Thus the various workmen who are assembling an automobile can each have a wrench of exactly the size to fit the particular nut which it is their particular task to turn on and tighten. The various stitchers in a shoe factory can each have a stitching machine especially designed for the kind of leather they are stitching, and the parts of the shoe which are to be sewed together. Think of the high degree of refinement to which dentists have developed their tools and materials.

Inventions.—There can be no doubt that specialization by tasks stimulates invention. The explanation advanced for this is that the reducing of a process to a series of easy operations, and the constant repetition of movements, suggests both to the workers themselves and to their overseers, ways of performing these operations by machinery. It is said that the eccentric on a steam engine (the mechanism which reverses the valves at each stroke of the piston) was really contrived by a boy who grew tired of working the valves by hand.

Analysis of Occupation and Task.—Closely related to the foregoing advantages of specialization is the incentive or opportunity it affords for making a careful study of one's occupation. By taking thought concerning their work and analyzing it according to the methods of modern scientific management, manufacturers have greatly increased the efficiency of all of the elements of production, and hence reduced costs per unit of output. Each group of specialists is constantly working to develop new knowledge, new methods and new technique in its field. Most of the progress made in all fields has been made by the men working in that field. It is the teachers who have contributed most of the progress in pedagogy, and the physicians who have contributed most of the progress in medicine and surgery. To-day, even such simple operations as laying brick, filling, sealing and stamping envelopes, and reading proof, have been analyzed by specialists so successfully that their time requirements have been more than cut in two in many cases. The

developing "science of management" has developed largely because of specialization by tasks and occupations.

Economy of Labor and Equipment.—There is a great saving in time in a modern factory because the worker does not have to move about from one work-place to another, or change his tools. He simply stands in one place, and does his particular task upon the shoe as it comes to him. If he needs supplies, he does not have to fetch them—instead, specialists in fetching keep a supply of them conveniently at hand.

At the same time, equipment is kept in full use all of the time. When one man performs several operations, part of the tools and machinery are always idle.

III. LOSSES FROM SPECIALIZATION BY PERSONS

It is just as suggestive of the real nature of specialization by occupations and tasks to talk about its disadvantages as it is to talk about its advantages. A number of disadvantages already have been suggested, but none has been clearly stated. Following is a list of the disadvantages that are usually mentioned:

1. Specialization distorts the individual by developing him along one line or in one of his capacities at the expense of all the others. There are three objections to this. One is that it is not good for the physique or mentality or attitude toward life of the individual that he be thus distorted. He will not be healthy in the physical sense. The constant exercise of certain parts of the body or muscles at the expense of the rest may so overexercise them as to cause premature aging of them. Many tasks overtax the eyes, or the hands or the arms. Others cause too constant exposure to heat or dampness or dust or fumes. Neither will such a person think well on questions outside of his own field, or for that matter, often in his own field. His interest in life may grow stale from too much routine in his existence. A second objection is that he forms habits so firmly that all his future actions are shaped by them. To use the popular phrase, he "gets into a rut." In consequence, when the time comes for changing his methods, he finds it very difficult to do so—the hand and the eye, unless painfully watched, follow the old action-patterns. This is even more true of his thinking than of his acting. We say of persons who have thus fallen into ruts in their thinking that they are "narrow-minded." A certain president of the United States was said to have a "single-track mind." As a matter of fact, however, as compared with the

ordinary trade-worker, or business man, or newspaper editor, his mind was immensely more open to suggestions. The third objection is that the doing of one thing for a long time unfits a man for other work later. The man who does heavy manual work for a period of years can very slowly, if ever afterward, become a good stenographer or skilled mechanic. The man who deals with children in the public schools for many years is seldom successful afterwards in handling men in the business world. A man who has been a journalist for many years seldom can afterward expect to become a good research worker.

Modern factory practice reduces all of these strains and hazards a great deal. It is the more repetitive of tasks, and those requiring the greatest muscular effort or other strains, that have been reduced to a machine basis. Hence it is much to be doubted if specialization by tasks as now practiced in most factories is in the aggregate really causing any more distorting of the individual than we would have without such specialization. The truth of the matter probably is that early specialization by occupations caused a great deal of distortion, and that specialization by tasks in its early days caused a great deal more; but that the combination of machinery with specialization by tasks in these later years has worked in the opposite direction, so that there is constantly less distortion in industry.

2. Specialization robs modern production of its educative value; that is, once a worker has developed the technique of his particular task, which frequently takes only a few weeks; he has nothing new to learn. If he stays at this task, he will never know much about the other parts of the product. If his job is buttonholing, he will never learn anything about the operations on the other parts of the shoe. In the old days when one man made a whole shoe, he spent several years as an apprentice merely learning how to perform all the different operations, and then took the rest of his life to perfect his technique. Thus at no stage in his life did his work ordinarily lose interest or educative value for him.

There is undoubtedly a great deal of truth in this criticism. It is no doubt the most serious charge that can be made against modern factory methods. One defense that is made is that there still remains a large number of jobs which require a high degree of skill, oftentimes an even higher degree of skill than was required before specialization was so far developed, and that the tasks with no educational value are just about as numerous in many factories as the proportion of workers who have small educational possibilities, or who have any

desire for educative labor. It must be confessed that there is a large number of workers who ask nothing of a job except that it do not overtax them and that it pay them well. The other defense is that the task makes only a slight demand upon the mind of the worker, and hence leaves him free to think about other things, both while at work, and after working hours, especially the latter.

3. It will follow from the foregoing that all tasks of the simple repetitive sort cannot escape being exceedingly monotonous. Workers under such circumstances become mere timeservers, interested only in the end of their day's work. Factory managers of course attempt to counteract this in many ways. One is by paying for labor on the piece-rate basis. Another is by "speeding up." With factory production highly organized as at present in all large factories, and most of the operations performed by machine, or under machine control, it is possible to control the speed at which the work is done. Not only can the workmen be kept from soldiering, but the machines can be driven at a speed so fast that only by keeping on the alert can the workmen keep up.

4. There is danger, however, in the speeding-up process. It is easy to carry it to a point where it is very wearing on the worker, and which leaves him no energy at the end of the day for any other form of exercise either mental or physical. That extreme specialization by task, when combined with machine methods, does lend itself to such abuse, is one of the most serious charges that can be made against it.

5. Both because, on the one hand, it is possible for a worker to learn a new task in a short time, and because, on the other hand, of the monotony of the work and lack of interest and of educative value in it, an important consequence of specialization by tasks in its present form is a very rapid turnover of the labor force of most factories. Even though it is confined largely to the workers at the simpler tasks, this constant shifting of workers from factory to factory is probably a great economic waste.

6. The fortune of the individual is much more dependent upon the market under a system of specialization. He is frequently trained and equipped to work only at some occupation which requires much special training or experience. If the market for that product falls off, he may find himself out of work, even if his job is one which is easy to learn. Changing to a new product means loss of time and expense, frequently the expense of moving his family. It means not only finding a new job, but fitting himself into it after he has found it. In most

cases, he will be able to find a new job enough like his old one so that he will have little difficulty in taking up his new task; but there will be times when this is not the case. When bicycles and carriages went out of use, the automobile took its place, and most of the skilled workers rather readily transferred from one to the other. When the breweries were closed down, however, many skilled workers in that trade had to acquire new occupations. The invention of the linotype machine made a large number of typesetters seek a new occupation.

The largest losses, however, are not from having to seek new occupations, but rather from time lost waiting for the market to pick up in the old one. As we shall see later in our study of economics, one of the accompaniments of modern specialization is a vast amount of disjointedness of industry. The various lines of production do not fit together as they should. There is overproduction of certain products at the same time that there is underproduction of others. In consequence, men are frequently out of work temporarily and cannot afford to turn to a new occupation, because they would probably be liable to the same mishap in the new one.

These disadvantages of specialization are real disadvantages. There is no reason why we should not recognize them as such. Some of the consequences of these can be ameliorated in large part, and others not at all. But whether they can or cannot, and giving them all possible weight, they are of far less importance to society than the above-named advantages of specialization. Specialization therefore keeps on developing. We are learning new ways to specialize every year. This does not mean, however, that we will eventually specialize in everything and upon all occasions. Also at any given time, specialization for many things would be a mistake. For example, it would be a mistake at present for the farmer to buy all his feed; for the housewife to buy all her food ready-prepared at a delicatessen and bake shop; or for a small retail merchant to contract his advertising to an agency.

IV. CONDITIONS ESSENTIAL TO SPECIALIZATION BY TASKS

As one looks over the various fields of production, one finds many places in which specialization by tasks has not developed at all, or has developed only to a small extent. This suggests that there are certain conditions which are essential to advantageous specialization by tasks, and certain limitations upon its further increase. Chief among these conditions are the following:

1. Production must be continuous, hour after hour, day after day, and in most cases, month after month. This is characteristic of all factory production. An automobile factory, for example, turns out a continuous stream of automobiles month after month with only minor seasonal variations. In contrast to this is ordinary farm production, where one man frequently works upon a dozen different products in one day, and usually changes his major operations every few days or every few weeks at the most. Farm work consists of a yearly round of operations in place of continuous production.

2. The production process must be comprehensive enough or involved enough to permit separation into tasks. A good many of the processes on a farm or in a store are so simple as not to lend themselves to being broken up into stages. The threshing operation on a farm is one of the few that lends itself to specialization by tasks. A small store permits specialization by tasks only to the extent of separating the work of waiting upon customers and making deliveries.

3. There must be volume of business sufficient to employ a full crew on the specialized basis. For example, in a small creamery making 50,000 pounds of butter a year, one man performs all the different operations, even including the keeping of the records. As the business expands, the keeping of the records may be turned over to a part-time specialist in records and accounts; or the simpler operations of weighing and packing the butter and the like may be turned over to an apprentice. As the business expands still more, another specialist may be employed to manage the whole enterprise. As a store increases in volume of business, it employs cash girls and bundle wrappers as specialists. A large department store also makes commodity specialists out of most of its salesmen.

It is easy to see how the volume of business places a definite check on specialization by tasks. Many an enterprise has specialized in this respect more than its business warrants. In consequence, many of its employees are only partly engaged a good deal of the time. Where the volume of business is as variable as in a department store, much of this cannot be prevented. There is no way of having help enough for the busy days and hours of the day without having too much at other periods. In such cases, the best that can be done is to secure a reasonably good fit most of the time.

If farms were considerably larger than they are, there would be much more specialization by tasks upon them. A dairy farm of a thousand acres would surely have several specialists.

4. If the processes lend themselves to machine execution, specialization by tasks is much more likely to develop. Machine execution develops best with operations consisting of simple unvarying repetition. Machines cannot think or use judgment. Neither can they adjust their methods to different individuals. If an operation must be varied according to the material worked upon, or the supplies used upon it, or the particular unit of product to be turned out, a machine will not serve. Neither will it serve if the operation requires dealing with individuals,—for example, such an operation as selling a suit of clothes or an automobile.

In many cases of this kind, however, a machine guided or directed by an individual with skill or judgment will serve very well indeed. In fact, by having a machine to do most of the work, to furnish most of the energy required for the operations, a worker can make his skill and judgment apply to a greatly increased amount of materials and product per day. Similarly a salesman properly assisted by cash-girls, errand-boys, and the like can bring his skill and tact in handling customers to bear on many more of them in one day.

5. Undoubtedly one of the reasons why specialization by tasks has developed so slowly in some parts of the world is that enough workers cannot be found who will concentrate sufficiently on their work to keep up the pace set by machine production methods.

6. It is exceedingly difficult to break up many production processes into steps or stages that can be fitted properly to one, two or any definite number of workers. For example, the operation of fitting a connecting rod into a frame may not keep one person entirely busy, whereas the next step in the assembling process may keep two men so busy that they cannot very well stand the pace day after day.

Thus, in conclusion, while it is true that specialization by tasks could be introduced into almost any production process, or could if the business were organized upon an appropriate basis, there are many processes which would lose rather than gain from such procedure. This will be particularly true of small enterprises, and of those constantly affected by seasonal and other variations, like agriculture, and of those not lending themselves to machine execution

V. SPECIALIZATION BY FIELDS OF PRODUCTION

In the rest of the chapter, we shall take up a few of the lines of production in which individual specialization is more or less developed and see in more detail what it is like.

Specialization in the Professions.—Chapter III lists 2,143,000 persons engaged in the professions in 1920. Of this number, however, 117,000 are classified as engaged in "semi-professional" pursuits, and 32,000 as attendants and helpers of professional workers. The semi-professional pursuits are such as the following: abstractors, notaries, justice of the peace, charity and welfare workers, officials of lodges, turfmen, sportsmen, etc. Chapter III puts the two million strictly professional workers in thirteen groups, the largest of which are as follows: teachers, technical engineers; trained nurses, physicians and surgeons; musicians and teachers of music; clergymen; lawyers; judges and justices; designers, draftsmen, and inventors; dentists; actors and showmen; authors, editors and reporters; photographers; college presidents and professors; artists, sculptors and teachers of art; chemists, assayers and metallurgists; veterinary surgeons.

There are a few things that stand out with respect to this whole group of professions. First of these is that they represent a higher degree of individual specialization than is possessed by any other group of workers. A few of these, it is true, are not very highly specialized—for example, teachers, photographers and reporters. But even these are highly specialized in comparison with most clerical and sales work and many of the hand trades. They are highly specialized both in that they require special inherent capacities and efficiencies, and in that they require considerable special training and experience. All except four or five of the groups require natural ability of considerably above the average sort. In most cases, it is mentality most of all that is needed. In other cases—the actor, the artist, and the musician, for example—it is some special talent of one sort or another. It is even said of teachers with considerable show of truth that they are "born and not made," which statement means that special natural talents of some sort are necessary for success. There is, of course, a wide range in the amount of formal training required before one can begin practicing the several professions, and an even wider range in the period of apprenticeship required before one is fully competent. A well-trained physician of to-day attends university and medical school for at least six years, and is a hospital interne for two years more, before he starts out upon an independent career. A photographer, on the other hand, in most cases merely works as an apprentice for a few years.

This group of occupations also has less of simple repetition and less

routine in it than any other group. This means that relatively few of the operations can be reduced to automatic actions. Most of them involve dealing with other human beings, and when human beings are to be handled, nothing can be automatic—each individual and each situation is different from every other individual and situation. In some of them, like the playing by a musician, there is a high degree of automaticity as a foundation, but there is also room for an unlimited amount of individuality in the performance which is built upon this foundation. This is almost equally true of the work of the painter, sculptor and actor. The work of dentists, draftsmen and the like has fully as much of the automatic in it as that of a musician, but far less opportunity for variation. This means that it is less interesting and more monotonous.

All of these occupations, but especially those which are based on the sciences, such as engineering, teaching, nursing, medicine, and dentistry, offer unlimited opportunities for progress through study and experimentation. This alone would make them proper fields for the specialist. The occupations which are based not so much upon science as upon technique, such as acting, painting, surgery and the like, have their counterpart to these in the unlimited opportunities they offer for individual development of technique. Few realize how hard our great artists labor to improve their technique and maintain it after they have once acquired it.

Most of these occupations also permit the individual to grow almost without limit through acquiring more and more knowledge of his profession. A lawyer can continue to be a student of law as long as he practices. A teacher of history can continue his studies of history.

For all the reasons here outlined, there is bound to be a wide range in the abilities of different members of each of the professions. Some will become physicians who are neither very intelligent nor very deft with their hands, or who take no interest in their profession—these will remain at the bottom. Others will be the opposite of these in all particulars and will climb far.

These occupations, like all others, do distort the individual. One of the principal disadvantages of most of them is that they do not include enough of mere physical exercise to keep the body in good condition. Teaching distorts because it develops certain mental habits that are undesirable outside of the classroom. This is especially the case with elementary teaching. The arts frequently distort because they develop the emotional side at the expense of the intellectual.

This is of course also true of preaching. Others distort merely because they keep the individual so busy that he does not have time to keep up his other interests in life.

Specialization in the Construction and Other Hand Trades.— According to the census, there were about 1,900,000 persons engaged in the construction trades in 1920, and probably over 1,000,000 in the other hand trades. Nearly half of all those in the construction trades are carpenters, and the others are mostly painters, electricians, plumbers, masons and plasterers. The principal other hand trades are custom tailoring, millinery, custom dressmaking, dyeing and cleaning, laundering, automobile repairing and shoe repairing.

These occupations, it will be apparent, represent considerably less specialization on the whole than the professional group just discussed, although there may be little to choose between members of the two groups,—carpentering and photography, for example. It is not likely that any great amount of special aptitude is needed for any of these occupations. Anyone with a fair physique and ordinary mentality can become a reasonably good carpenter, or painter or plumber or tailor or dressmaker. A certain inherent manual dexterity is needed more than anything else, but the requisite amount of it is not hard to find. Furthermore, all of these trades can be "learned by doing," that is, they lend themselves to the apprentice system of training. This means that the beginner is useful right from the start, and in nearly all cases is paid something of a wage while learning the trade. The period of apprentice training can be lengthened so as to include all the branches of the trade, or restricted to the simplest forms of work.

At the same time, these occupations have more of simple repetition in them, require the taking of less thought, and become more automatic. But they are by no means altogether automatic. Every window or door that a carpenter fits requires some special individual attention; likewise every suit that a tailor fits.

We now enter a field where adaptation of tools and equipment becomes of much importance. For some of these occupations, the tools and equipment are already pretty well standardized and little improvement is being made. All that the apprentice needs to do is to master the use of these tools. In automobile repairing, however, new developments are constantly under way; and this is probably true in dyeing and cleaning.

In some trades the improvements are in methods and technique more than in tools and equipment. No doubt the workers in some of

these trades are constantly trying out new methods. Tailoring, dressmaking and the like are constantly experiencing changes; but these are changes in the styles rather than in methods. Taking the group as a whole, much less attention is being given to improvement than in the professions analyzed above.

Some of these hand-trades are no doubt more than usually distorting in their effect upon the individual, like tailoring and shoe repairing, for example. On the whole, however, the hand-trades are less narrowing in their effect than most other occupations. The manual dexterity acquired in one of them is rather easily carried over to another. A plumber can be made into a carpenter more readily than one who has never learned any manual trade. Dressmaking and millinery are closely allied.

Some workers at these trades will have more mentality and some less, than they really need for the trade which they follow. Some will be naturally faster workers than others. Some will have more natural manual dexterity than others. Some will have the attitude of mind which inspires them to better and better technique; others will be content with mediocre attainments. For all these reasons, there will be a considerable range in ability between the best and poorest; but by no means as wide a range as in the case of the professions.

Specialization in Common Labor.—There is in every country a large group of workers who are classified as common or unskilled laborers. This means that they have no regular profession or trade, and work mostly on jobs that require no special training or experience; or at least so small an amount of it that it is taken for granted that almost any worker has it. This work consists of such operations as shoveling, pushing a wheelbarrow, loading and unloading lumber, coal or feed. Most farm work is usually classified as common labor—such work as pitching hay, hoeing and driving a team—in spite of the fact that it may require considerable experience if it is done effectively. The point is that the experience needed is acquired easily and hence is commonly possessed. Here, then, we have the other extreme in the matter of specialization from the professions which we discussed first.

But even in this case, it cannot be said that there is no adaptation to tasks. Some common labor requires much strength and endurance; some of it more judgment and less strength and endurance. Men working at all kinds of common labor intermittently and in turn do become more or less adapted to this general kind of work, and unfitted for a higher class of work. Their experience with one kind of work

carries over in part to other kinds of work. Some of them become skilled in each of the several kinds of common labor at which they occasionally work. Not least in importance among these adaptations is the attitude of mind which such workers acquire.

The common laborer seldom gives any thought to his job other than for the moment. He, least of any, has that interest in his work which is necessary for individual progress and general improvement in methods. And yet his work is not always uninteresting. A common shoveler on a construction job has more variety by far in his work than some trade workers.

Specialization in Factory Work.—In many respects, specialization takes its extreme form in a large factory turning out a product like automobiles. Such specialization is mostly by tasks rather than by occupations. In factories of this sort, natural abilities figure only in determining at which task a person will be set; very little special training or experience is needed for very many of the tasks. There are always some, however, which need skilled workers. For such workers the discussion of the hand-trades in this chapter will fit pretty well. For the ordinary factory laborers, the discussion of common labor will fit well, except for one thing, namely, that the operations performed by factory labor in factories of this sort go farther in unfitting the individual for other kinds of work than almost any other type of work known. The higher forms of work in a factory, the excessive types of work, belong in the same general class, so far as the purposes of the present analysis are concerned, as the professions.

SUGGESTIONS FOR FURTHER READING

Other discussions of the specialization by occupation and tasks are found in John Stuart Mill's *Principles of Political Economy*, Book I, Chapter VIII; in L. C. Marshall and L. S. Lyon's *Our Economic Organization* (1921), Chapters X, XII and XIII; and in Alfred Marshall's *Industry and Trade* (1919), Book II, Chapter II. F. W. Taussig also discusses the subject in his *Principles of Economics* (1921), Vol. I, Chapter 3, particularly Sections 1 to 6, inclusive. O. Fred Boucke's *Principles of Economics* (1925), Chapters 12 and 13, also contains additional material dealing with specialization and machine production.

PROBLEMS

1. Distinguish between occupation and task.
2. What does the census mean by an occupation? How does it differ from a trade?

3. Many so-called "white collar positions" pay less than common labor jobs. Can you account for this?
4. Give some illustrations of cases of specialization by occupation which are not specialization by tasks.
5. Would you expect to find a condition similar to specialization by tasks in the Mayo Clinic at Rochester, Minn.?
6. What is meant by the internal and the external conditions upon which specialization of persons is based?
7. The text discusses four sources of individual differences. Show how each may influence individual specialization. Give examples other than those used in the text.
8. How do the external considerations affect specialization by persons?
9. To what extent would you expect to find division of labor in a large law office?
10. Is specialization by tasks in harmony with or in opposition to the natural tendency of the survival of the fittest?
11. What kind of specialization do you find in an army?
12. An artificial limb company employs practically nobody except crippled persons wearing its limbs. How do both the cripples and the company gain from this?
13. Give an example illustrating each of the gains from specialization by persons.
14. Give an example illustrating each of the losses from specialization by persons.
15. Do you know of any inventions brought about as a result of division of labor? Any that produced further specialization of labor?
16. Select some occupation with which you are familiar and discuss it under the following heads:
    a. Extent and forms of repetition in it.
    b. Amount of individual attention that must be given to each piece of work.
    c. Amount of thinking required.
    d. Extent to which it (1) distorts the person physically, (2) unfits him for good thinking in his own and other fields, and (3) narrows his interests.
    e. Extent to which it makes the person dependent upon an uncertain market.
17. Select a business which you know is highly specialized by tasks and show to what extent each of the conditions essential to specialization by tasks is present.
18. Select a business which is not highly specialized and show to what extent each of the conditions essential to specialization by tasks is absent.
19. The dean of a law school made the statement that brains are the cheapest thing in America. What do you suppose he meant?
20. Would you consider that specialization by persons has about reached its limit or will it be likely to progress still further than at present? Give reasons for your conclusions.

CHAPTER VII

SPECIALIZATION BY AREAS AND LOCATIONS

In Chapter VI, the principle of comparative advantage was presented in its application to persons specialized by occupations and tasks. In this chapter, it will be presented in its application to areas and locations. It will be considered as between areas and locations close together and in the same country, for example, as between various portions of the vegetable and fruit and fluid milk areas for a large city; as between cities in the same region, such as Chicago, Minneapolis, St. Paul, Duluth and Superior; and as between countries as far removed from each other as the United States and Japan. It will be discussed in the chapter as it applies to agriculture, forestry, mining and manufacturing, and to some extent to trade and transportation.

I. BASES OF TERRITORIAL ADVANTAGE

The principle of comparative advantage when applied to areas is likewise based upon internal considerations, or those pertaining to the area in question, and upon the external considerations of supply and demand—the supply of areas suitable for the production of the commodities capable of being produced in these areas, and the demand for them. In the following discussion the two types of considerations are combined.

Climate.—The most outstanding of all the internal factors determining comparative advantage is climate. It is really more significant for agriculture than for the other industries, but is significant for all. Climate is a very comprehensive term. It includes temperature, frosts, rainfall and humidity, winds—in fact, all atmospheric conditions whatever. It will be necessary to discuss climatic influences somewhat more in detail. The analysis of the climate of a region usually considers all of the following points:

a. *Mean annual temperature*—an average of day and night temperature winter, spring, summer and autumn. As a measure of the climate of a region, mean annual temperature has only a limited use. Two

regions may have the same mean annual temperature, but one being an island may have summer and winter temperatures differing only by 20 or 30 degrees, while the other being an interior region may have summer and winter temperature differing by 50 to 60 degrees.

b. *Mean seasonal temperatures* are more useful, but even these are not refined enough. Two regions may have the same mean summer temperature, but one may have much cooler nights and hotter days than the other. It is a well-known fact that the corn crop requires warm nights to grow properly. Two regions may have the same mean spring temperature, but one may be located on the leeward side of a large lake in a region of fairly warm climate, and hence have a relatively cool protracted spring; while the other is farther north in the interior in a region of many sunshiny days. Hence one may be well suited to fruit and small grain, while the other is better suited to corn. Of the mean seasonal temperatures, the summer mean, or better still, the growing season mean, is most useful.

c. *Mean temperatures for January and July*, the coldest and warmest months of the year, are of considerable significance, especially the July mean.

d. *Mean daily range in temperature during the growing season*—or in certain months in the growing season, also helps us to understand climatic effects in certain regions.

e. *Length of the growing season*, measured by the number of days between the last killing frost in the spring, and the first killing frost in the autumn, is one of the more useful of the measures of climatic differences. One of the reasons for this is that many crops have fairly definite growing seasons—corn, for example. Some relatively short growing seasons, however, mature a crop of corn better than some longer seasons. Growing seasons may be short at different ends. Late springs may be followed by late autumns, and early springs by early autumns, and these circumstances affect various crops very differently. Regions with springs cool and protracted because of water influence may have long growing seasons, but during much of the spring very little growth takes place. For example, the Keweenaw Peninsula in Lake Superior has a growing season of 140 days, but apple trees do not bloom there till June.

f. *The average dates of first and last killing frosts* come somewhat nearer to the necessary refinement on this point. Still more useful would be data as to the number of years in ten in which frosts come before a certain date in the fall, or after a certain date in the spring.

g. "*Effective heat*" is perhaps a still more refined concept. Very little plant growth takes place at temperatures under 42 degrees. Effective heat is a measure of total heat received during a whole season in excess of this 42 degrees. On this basis, interior climates may show to better advantage than insular climates in the same latitude.

h. *Insolation* is a term used to refer to the amount of sunlight that falls upon the surface in a given area. It depends principally upon the angle at which the sun's rays strike the earth, and the length of the period of sunlight. It therefore varies with latitude and the season of the year. The higher latitudes have a surprising amount of insolation during the growing season because of the long period of daylight. It is for this reason that it is possible to mature crops of small grain and roots so far north. Insolation is also affected by the proportion of cloudy days during the growing season, and the slope of the surface. The insolation of a southern slope is much greater than that of a northern slope.

i. *The percentage of cloudy days*, and of days during which some rain falls, and the seasonal occurrence of the same, are also of some significance with respect to certain crops—for example, small grains, hay, cotton, coffee, fruits of certain types.

j. *Mean annual rainfall* like mean annual temperature is significant only in a general way.

k. *Mean seasonal rainfall*, or better still, the distribution of rainfall by months, is almost necessary before one can speak with definiteness of rainfall influences. Some very low mean annual rainfalls suffice for the growing of certain crops in some regions because the rain nearly all comes at the right point in the growing season.

l. *Rainfall variations from year to year* are of great significance. Semi-arid regions occasionally have more rainfall than they really need with the systems of agriculture practiced in them, and these excesses help bring up the average and conceal the fact that there are many years when much less rain falls than is needed to mature a crop. Even semi-humid regions suffer in occasional years from too little rain.

m. *Number of drought periods of various lengths in a given number of years* is a useful method of measuring rainfall deficiencies.

n. *Rate of evaporation* is almost as significant as amount of rainfall. Evaporation varies with insolation, wind, humidity and rainfall. Areas in western North Dakota with the same rainfall as areas in

western Texas can grow crops requiring more rainfall, for the simple reason that the rate of evaporation is lower.

o. *Humidity* is closely associated with rainfall, but is not entirely identical with it. Areas may rank higher or lower in humidity than in rainfall. Areas bordering on larger bodies of water are likely to have humidity out of proportion to their rainfall. Humidity has its effects on plant life entirely aside from its relation to evaporation and rainfall.

p. *Winds* have their indirect effects on temperature, rainfall, evaporation, and in addition various direct effects on certain crops. There are the drying or scorching winds that blow from deserts and semi-arid plains, the melting winds that blow down the eastern slopes of the Rockies, the hurricane winds that raise such havoc with the banana and other crops in the tropics.

q. *The snowfall* of a region is probably most important for agriculture because of its influence upon the survival of winter grains and forage crops over the winter.

r. *Hail storms*, tornadoes, blizzards and the like also have their influence upon agriculture.

Each of the crops has its capacity for temperature, moisture, sunlight, humidity, etc. Each area has its supply of these essentials to plant growth. Other things being the same, the crop which will grow best in a given region is one whose capacities most nearly fit the supply of these essentials available. In some cases, growing season is the important consideration, in others rainfall or seasonal distribution of rainfall, etc.

There is an abundance of land in areas with climate suitable for most of the important crops and species of live stock. Wheat, for example, can be grown almost anywhere in the temperate zone outside of the few arid and humid regions, and the high latitudes just under the Arctic Circle. But not all of this area has an equally suitable climate. The best wheat is grown in regions of moderate rainfall, and particularly in regions having winter and spring rains and a dry harvest period. Great as is the amount of wheat which is consumed, not all of the areas that might be used for the growing of it are so used. In the first place, certain competing crops—corn for example—have a more limited area relative to the amount of them that might be consumed. Wheat is therefore only a secondary crop in the corn belt, except on its western edge, in western Kansas and Nebraska, where the rainfall gradually becomes too scanty for corn. In the

second place, there is more potential wheat land than is needed to grow what wheat the world will consume under present conditions. But any region which, because of receiving rainfall in the winter and spring, like the Mediterranean region, is especially well suited to wheat, is likely to grow considerable wheat no matter how severe the competition.

North of the corn and winter wheat region is a vast area suitable only for hay, small grains, root crops and dairy cattle. The amount of land available for these products is in excess of the present demand for them. Under these circumstances, corn and spring wheat are likely to be pushed northward into this area wherever possible.

Nothing has been said of the influence of climate upon the distribution of live stock. As a matter of fact, it is almost as important as the effect on crops. Certain animals have fairly distinct northern and southern temperature limits within which they thrive; or different rainfall conditions which are favorable to them. Sheep are perhaps most susceptible of all live stock to direct climatic differences. In some cases it is disease or pests that determine the southern limit, as apparently with cattle in our own southern states. In more cases, it is inadequate pasturage. Grass does not thrive in warm climates, and neither does it thrive in too arid climates; but some form of grass will grow with less than ten inches of rainfall, when almost nothing else will grow. Consequently the near-arid regions of the earth are generally given over to grazing sheep, goats or cattle. In the far North, the reindeer are able to subsist upon moss.

Live stock production also follows other sources of feed. For example, beef, cattle and swine follow corn, and dairying follows hay.

The localization of lumbering is in large part only indirectly affected by climate. Where there are no trees there can be no lumbering; and trees do not grow in semi-arid regions, nor in too frigid regions. Moreover, the types of timber which are most generally useful, such as the conifers, grow mostly in temperate climates. Climate also affects the lumbering industry by determining the localization of the population, which in turn determines the demand for lumber and the labor supply. The direct influences of climate upon lumbering relate to the lumbering operations themselves. These are generally aided by winter snowfall, and greatly impeded by the jungle growth and heat and humidity of many tropical forests. Lumbering makes slow progress in the tropics.

The mineral resources of a region, unless very rich, will not be

developed if too far north, and the development will be greatly impeded if the region is too far south or too dry. The mineral resources of both the tropical and the arctic regions are poorly developed. One reason for this is the quality of most of the people living in such regions. Another is that large industrial cities are not likely to arise in such climates. The island of Spitzbergen, halfway between Hammerfest and the North Pole, has one of the richest coal deposits in the world; but it is being worked only slightly. Only recently has any country been interested enough in the island to lay claim to it.

The effects of climate upon the localization of manufacturing are very largely indirect, through its effect upon distribution of population, labor supply and sources of raw material. There are, however, some exceptions to this. The English claim that the dampness of their atmosphere aids their spinning. Some elementary manufacturing operations, such as fruit-drying, depend upon an abundance of sunlight. Butter and many kinds of cheese cannot be made to advantage in warm climates. The cheese industry of Wisconsin is apparently bounded on the south by the line showing a growing season of more than 150 days.

Water Supply.—Closely related to climate and rainfall is the water supply. The available supply of water will irrigate only a small portion of our semiarid West. It affects live stock farming perhaps more than crop farming. Live stock cannot be pastured in a region with no water supply. Mining is retarded in our Southwest because not enough water is available for the ore-dressing processes. Where water is available, hydraulic mining is sometimes practiced. Water even for drinking is at a premium in the region of the nitrate mines of Chile, and the borax mines of California.

Soil.—The influence of soil upon localization is confined almost altogether to agriculture and forestry. In general, a soil which is good or poor for one crop is good or poor for all crops, and many crops will grow with some degree of success upon almost any kind of soil, provided the moisture supply is adequate, and the fertility is maintained at a fair level. But there are some which are extremely sensitive to soil differences, and most of the others easily have their preferences, so that on the whole the influence of soils upon crop distribution is pronounced. The exact location of the oats, rye, potato, and tobacco acreage cannot be explained in any other way. The area in which the finest grade of Havana tobacco is grown occupies only twenty-five square miles in one province in Cuba. Soils even have an important influence

upon the location of such major crops as hay, corn and sugar cane. The effects of soils upon crop distribution are much more local than the effects of climate. This could not be otherwise, since soils themselves vary greatly from county to county, and even square mile to square mile.

The working out of the principle of comparative advantage in the case of soils is illustrated by the following table, in which I, II, III, IV and V, are five different soils. The numbers represent returns per unit of the production elements used. For example, Soil I ranks best for hay and oats, third best for corn, fourth best for potatoes, and poorest for truck crops. Soil V is poorest for hay, oats and corn, but second best for truck crops. Soil I is probably a heavy clay soil. Soil II is perhaps a black prairie soil, excellent for corn, fair for potatoes, and poor for truck crops. Soil No. III, let us assume, is a heavy sandy loam, fairly well suited to hay and oats, good for corn, excellent for potatoes, and fair for truck crops. Soil No. IV is assumed to be a medium grade of sandy loam, and Soil V a light grade of sandy loam. It is clear that No. V is the poorest soil of the five, although it is pretty well suited to truck crops. No. IV is next poorest of the soils, but is better suited for truck crops than any of the others. Truck crops will surely be grown upon Soils Nos. IV and V, unless it should happen that there is not enough of Nos. I, II and III to grow the other crops. Potatoes will be grown on Soil III, but if there is not enough of this, some may be grown on II or IV. Of course we shall see later on that usually several crops are grown upon one farm, even though the soil may be of the same type.

SOILS	CROPS				
	Hay	*Oats*	*Corn*	*Potatoes*	*Truck*
I.............	5	5	3	2	1
II.............	4	4	5	1	2
III............	3	3	4	5	3
IV............	2	2	2	4	5
V.............	1	1	1	3	4

Soil influences upon the distribution of live stock are indirect, that is, they grow out of the plant life of the region, which in turn is partly determined by soils distribution. An interesting example of this is the supposed relation between limestone prevalence and fine horses.

Availability of Raw Materials.—The primary factor in determining the location of mining, lumbering and manufacturing is the

location of the supply of raw materials. There can be no mining without a mineral deposit. Comparative advantage in mining is therefore based first of all upon *the deposit itself;* the richness of its ore; the freedom of its ore from deleterious ingredients, like sulphur and phosphorus in iron ore; the ease with which the ore can be separated from waste material and impurities; the depth of the deposit below surface; the mining hazards, such as water, mine gas, cave-ins; the size of the deposit, affecting the cost of its removal, etc. As one high-grade ore deposit after another is exhausted, the mining moves on to lower grade ores. Similarly the lumbering industry follows the forests. The location of ore deposits is not the only factor, however, which determines the location of mines. Many high-grade mineral deposits are not being worked. The reasons for this will be presented under other heads following. The same situation maintains in lumbering.

Manufacturing plants must have a supply of raw materials before they can operate; but they need not always be located close to the sources of supply. A good deal of American cotton is made into cloth in European mills, and the American cotton mills are more largely in the North than in the South. Cotton, however, is a commodity which can be transported rather readily, because of its high value per pound and because it does not suffer damage in transit. Live stock tends to be slaughtered near to the place where it is produced. It is cheaper to ship meat, even fresh meat, than it is to ship cattle and hogs. A hundred pounds of wheat makes about seventy pounds of flour. Hence there is something of a tendency for wheat to be milled close to where it is produced. If, however, the by-products, the bran and middlings, are also needed in the importing country, the whole wheat may be imported and the grinding done at home. Sawmills, paper mills, ore dressing plants and smelters are situated very close to the regions of supply; but sometimes it is cheaper to transport the ore than it is the fuel needed for smelting it. The factories that pay least attention to locating close to their supply of raw materials are those like watch factories and silk factories which make a product which sells at a high price per pound.

Manufacturing industries using imported raw materials in whole or in part, such as the silk and woolen industries, are likely to locate close to the seaboard. Our shoe factories which use leather from imported hides mostly are located near the seaboard.

Sources of Power, Fuel and Other Supplies.—Before the steam engine was invented, water power determined the location of more factories than probably any other thing, and it still is a very important factor. If water power is available, raw materials will be transported considerable distances to take advantage of it. The factory no longer has to be located exactly at the power plant; electric power is transmitted economically as far as 300 miles in some cases to-day. Unfortunately most of the undeveloped water power in the United States is upon the Pacific Coast, much of it far removed from large sources of raw materials. The water powers in the Atlantic states are used for textile mills especially. The topography of the Atlantic seaboard is such as to determine very definitely the location of the water power cities. Geologically the Atlantic seaboard consists of a belt of level coastal plain, and parallel with this the Piedmont or foothills region. Each stream crossing the line between these two belts has more or less of a waterfall. Some of the cities located upon this "fall line" are Lewiston, Maine; Manchester, New Hampshire; Fall River and Lowell, Massachusetts; Trenton, New Jersey; Columbia, South Carolina. Among European countries, Norway, Sweden and Switzerland depend more upon their water powers than other nations. France is now developing the water power resources of the Rhone river upon a large scale.

Where water power is not available, coal or oil are absolutely essential for manufacturing. The United States is especially favored by having coal and iron deposits so near together in Pennsylvania, Alabama, Colorado and elsewhere. The great iron deposits of the Great Lakes region are so close to the Lakes that the ore can be transported very cheaply to where it is needed. If more of the manufactured iron products were needed in the West, however, it might be cheaper to transport the coal to the iron than the iron to the coal. In California, oil is still so abundant that the water powers have been only partly developed.

The mining industry needs power, either water power or else fuel for steam power, and it frequently needs timbers or cement for mine supports. If fuel is available, ores can be rendered near the mines, and hence transported at greatly reduced cost. On this basis it may prove profitable to work otherwise worthless deposits.

The localization of agriculture is influenced in many cases by the availability of supplementary feeds or fertilizers. The United States depends upon Chile for its nitrates and upon Germany for its potash,

which adds considerably to the cost of these. Denmark purchases cottonseed cake for cattle feed from the United States.

Geographical Position and Available Transportation.—Under this head is included geographical position with respect to rivers, mountain ranges and mountain passes, and seaports and harbors, as determining transportation outlets for products; also geographical position with respect to cities and consuming centers for the various products. A region may have comparative advantage for a certain product so far as climate or soil is concerned, but be so far removed from consumers for this product that it will pay it to produce other things. This is the difficulty confronting agriculture in many of the irrigated districts in the West. The bulkier the crop, the greater the difficulty.

Our manufacturing industries are concentrated on the Atlantic seaboard to the extent that they are, partly for some of the reasons always given, partly because it is here that our own consumers are most concentrated, and partly because this part of the United States is nearest to the countries that are buying our manufactured exports. As our population spreads westward, more and more manufacturing will follow it. There has been a great increase in manufacturing in Ohio, Indiana, Michigan, Illinois and Wisconsin in the last twenty years. The industries developing here are the ones that supply the needs of the areas roundabout and to the west—particularly the needs for farm implements, tractors, trucks, automobiles and the like. The bulky commodities will be the ones most likely to move west with the population. Commodities of high specific value, like textiles, clothing, jewelry and chemicals will still continue to be manufactured in the East.

Also wherever lines of transportation collect, there will manufacturing enterprises develop. Such cities are always points where raw materials are assembled and then distributed again to the various consuming areas. They are therefore the logical points for doing whatever manufacturing or processing the raw materials need. This will especially be the case if the point is also a harbor. This means that it represents a break in transportation. Since the products must be unloaded anyway, they might just as well be processed before they are reloaded. In the days when water transportation was all-important, waterfalls were always breaks in transportation, and hence nearly always the sites for cities.

It is especially important that ore deposits be well located geograph-

ically. The value of deposits of fuel and iron depend largely upon such things as their nearness to a harbor, to a navigable stream or canal, or to other transportation routes; or to consuming areas for products made from them; or to other raw materials, like coal or lumber, which are combined with them in manufacturing. There is an immense deposit of iron ore in Brazil, but it is back from the coast over a mountain range.

Timber is so bulky a product that location near to population centers is of primary importance. Only at the high prices of the last decade or so has it paid to transport timber from the Pacific states to the Mississippi river valley states. The best timber and the timber nearest at hand are always cut first. When the supply is used up, then logging begins in areas farther away, and the second quality of timber is cut. Eventually, after about all the natural supply of timber in a region has been logged, the nation begins to think of artificial forestry. At first this is likely to take the form of more careful cutting of the forests still remaining. Later, actual replanting is practical.

Transportation has a very important relation to specialization. Without modern transportation facilities, specialization would probably not be developed to one-tenth the extent that it is to-day. Each improvement in transportation has added new conquests to specialization. Fresh strawberries are now shipped from California to New York City. Fresh eggs and butter produced in the flush of production in the southern hemisphere summer are now being shipped across the equator to reach our winter markets. Transportation facilities thus place a limit upon and determine the extent to which comparative advantage can operate. The length of the haul is not the only consideration. It is important whether it is a water haul or a rail haul, especially for bulky commodities like coal, iron ore, lumber, hay, potatoes and even grain. The topography of many regions makes rail transportation difficult. The water routes may be closed for a good part of the year by ice.

The influence of transportation upon the localization of agricultural production was early presented by the German economist Von Thünen in his *Der Isolerte Staat.* Von Thünen first imagined a city lying in the midst of a large fertile plain without rivers or any means of transportation except by wagon. Figure I represents such a city and the concentric zones of production approximately as Von Thünen described them. In Zone 1 are produced the products which are both

bulky and highly perishable; in Zone 2, the products which are either less perishable, like potatoes, or less bulky, like milk. In the third

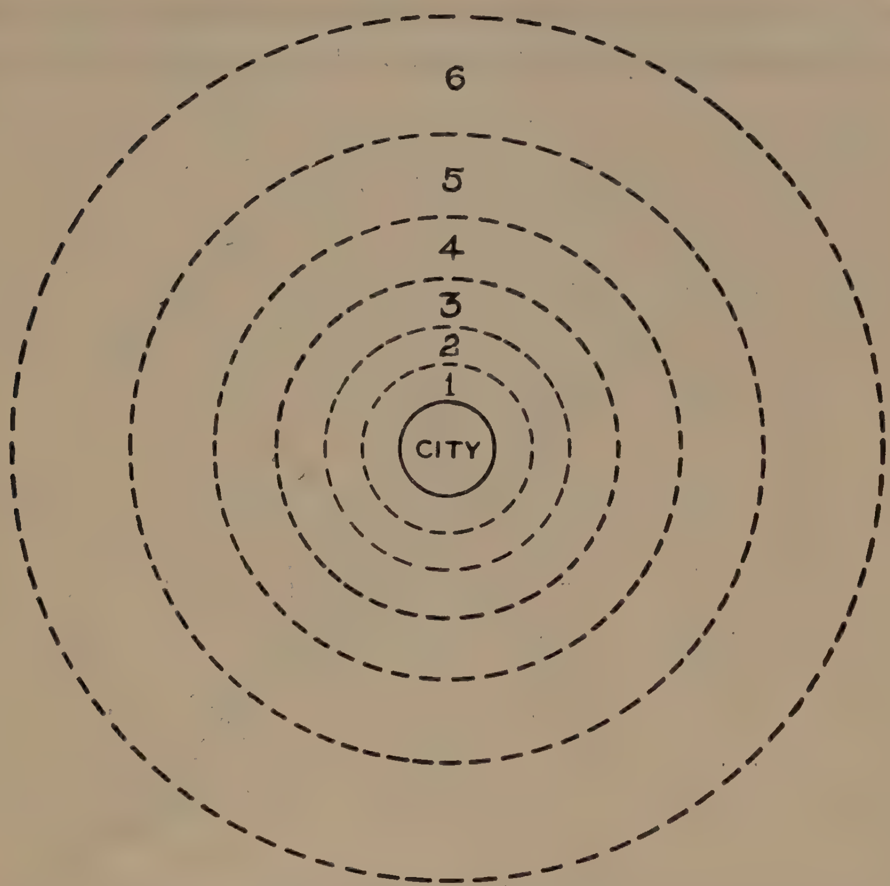


FIG. I. Zones of Production Surrounding a City on a Plain. (*Adapted from Von Thünen*).

zone, the milk is made into butter, a product still less bulky. Farther out, the grain is fed to live stock and transported on the hoof. Finally comes the range.

Von Thünen then imagined a river flowing through this plain and city. The zone lines would be extended in both directions near the river, but especially upstream, as in Figure II. Modern city market areas represent simply in exaggerated form the same effect as the river in Von Thünen's illustration. Each railway line leading into the city bulges out the zones, each trolley freight line, each motor truck line or paved road. The bulges produced by railway lines sometimes reach out long distances. For example, New York City has in times past received some of its milk supply from Canada. A milk station upon a railroad two hundred miles from Philadelphia may be nearer to it in effect than a farm upon a poor road ten miles out. The result

is that while whole milk is being shipped from far outside the confines of New York State, butter and cheese are being made at out-of-the-way points everywhere.

The circumstances determining the location of lines of transportation will be taken up in a later chapter. It is not an accident that so

FIG. II. Zones of Production Surrounding a City on a Plain—with a River Flowing Through—(*Adapted from Von Thünen*).

many lines of transportation converge at Chicago, New York and St. Louis.

Topography.—The effect of topography is more pronounced upon agriculture than upon other lines of production. In general, pasture and hay crops are grown upon the steepest hillsides, and crops like apples and other orchard fruits, grapes, coffee and tea upon hillsides somewhat less steep. Some crops require hillsides especially either because they have superior air drainage or water drainage, or because they have better insolation. Topographic influences may affect the production of a whole region—like the Allegheny region, or the Great Plains—or they may affect the distribution of production on units as small as a single farm. In the last analysis, the effects on the individual farm organization are of most importance.

Topography affects the distribution of live stock production because it determines the hay and pasture areas of the earth, and because certain species or breeds of live stock are not suited to lowlands or to highlands. Most breeds of sheep will not thrive in damp pastures. The goat is found principally in rough regions with scanty vegetation.

In the end, the roughest lands of the earth will be used for timber, pasture or just scenery. Those which will grow timber will probably be mostly reserved for timber. Some of them are too nearly arid to support trees, or are above the timber line on mountains. But there are intermediate areas which would grow trees if not pastured, whose utilization will depend upon the relative demand for lumber and live stock. Considerable of the remaining timber land of the United States is upon difficult, in some cases almost inaccessible, mountain slopes.

Density of Population.—So far as agriculture is concerned, a densely populated area is likely, in the first place, to grow intensive crops, that is, those producing a large yield of food per acre, like potatoes, corn, rice, vegetables, etc.; and in the second place, those which can use a great deal of hand labor like fruit and truck crops, potatoes, sugar beets, rice, flax for fiber, hemp, tea, silk and cotton. The crops with large yields per acre are frequently bulky crops that are difficult to transport; but with a dense population, they can be consumed very close to where they are produced. Very densely populated regions, like China and India, are not likely to grow much live stock—the food is too badly needed for direct human consumption. Regions a little less close to the margin of subsistence—like Spain, Italy and the Balkan states—will keep small species of live stock, like goats, swine and sheep. Regions still farther removed—like Germany, France, Holland and Denmark—will keep a great deal of live stock, especially cattle and swine, and give it a great deal of individual attention. The cattle will be used for draft purposes as well as for meat and milk. The milk will all be utilized for human consumption, some of it in the form of skim-milk cheeses. One of the reasons for live stock production is that waste feeds of various kinds can be salvaged in this way. Even the Chinese farmer keeps a few hens and sells a few eggs.

In regions of sparse population, at the other extreme, the farming may be largely of the live stock type. The 2200 people living on the Falkland Islands, off the east coast of South America in the latitude of southern Argentina, average 300 sheep per capita. In other sparsely

populated areas, small grains are the principal crops, especially wheat. Whereas in densely populated areas, the products consumed are mostly produced at home, in sparsely populated areas, they are mostly obtained in exchange. The farmers in the New World are far less self-sufficing than those in the Old World.

Labor Supply.—A great density of population means of course an abundant supply of labor not only for agriculture, but for all industries; but especially for agriculture, since such a large part of the energy of a dense population must be taken up with producing food and clothing, unless like England and Belgium, it can procure its food and clothing largely by exchanging manufactured goods for them. As already pointed out, there are certain types of agricultural products which require hand labor especially. The same is true in manufacturing, as evidenced by such products as lace, linens, women's hats, china, jewelry, toys, and scientific instruments. There are others in which either hand labor or machine labor can be used with very little difference in quality of the product—men's clothing and shoes, for example. There are others in which machine methods have a distinct advantage—for example, those requiring great power, or high uniformity in the product. The products which have most advantage in a densely populated country are those that most need hand labor. If these products do not use all the available labor, then products will be taken up which can make use of hand labor if it is cheap enough. Thus it is the densely populated regions of Europe in which laces, linens and the finest quality of textiles are made; also the finest quality of metal goods, jewelry, toys and the like. The manufactures of the Orient are of similar type. In the United States, the clothing industry is mostly in the East for similar reasons, and the farm machinery industry mostly in the Middle West.

One of the reasons why American industry has been slow about developing the making of the finest grades of goods is that our laborers have not possessed the necessary skill. It takes time to develop a labor supply sufficiently skilled to make high-grade watches or surgical instruments. The Europeans had the advantage over us in this respect in that their populations had acquired this skill in the handicraft period and they simply carried it into the factories with them. Our earliest factory workers, on the other hand, mostly came from our farms, or if they came from Europe, they were mostly peasants or common laborers. The highly skilled craftsmen of Europe have been the slowest to migrate to America.

The influence of this is particularly noticeable in our textile industries. Most of the very finest textile goods are still imported in spite of high protective tariffs. But our factories are making better and better grades of textiles each year. Textile manufacturing is new in the South. Consequently only the coarser grades of cotton goods are now made there.

Large-scale machine production, moreover, has made the American factory worker so productive, and is enabling him to earn such high wages, that before the higher grades of goods can find a place in the American factory, they must be reduced to a machine basis or they cannot compete successfully for labor.

Mining operations take much labor, even with all the improved machinery for drilling, underground transportation and the like. Part of the work requires skilled or semi-skilled labor and part of it only common labor. Most of the work is heavy. The original supply of mine laborers was mostly recruited from farms in the mining regions. The first important group of foreigners to come to this country to work in our mines were from Cornwall in England, from a region where the people had been miners for many generations. As long as drilling was done by hand, these were the most skillful miners to be found anywhere. In the last fifty years, many other groups of foreigners have entered our mines, Italians from the north of Italy, Germans, Austrians, and particularly Finns and Mexicans. In some areas, however, the miners are still over half native-born, including those born of foreign parents. This simply means that the family has remained in the mining industry. This is characteristic of the Cornish miners, but not of the Finns.

The mining companies of this country have usually been able to obtain an adequate labor supply by paying wages about equal to those in competing industries. Unskilled foreign labor has flocked rather freely to mining because it is a type of work much of which can be learned quickly and at which good wages can be earned from the start. Once a few foreigners of one race find their way to a mining region, others of the same race are sure to follow. At present writing, the bituminous coal mining regions are greatly oversupplied with laborers, with the result that there is a great deal of idle time throughout the year. Individual mining enterprises here and there, however, have found it difficult at times to secure the labor needed. This is especially true in the West.

Much of the labor of the mines is rather mobile and shifts from

area to area. This is partly a habit with them, formed as a result of a good deal of roving that has been forced upon them in the past. Mines frequently become exhausted, forcing everybody to move. Many mines operate upon so close a margin that a decline in prices forces them to close down. The consumption of metals is greatly affected by business prosperity. New construction is not undertaken in a period of depression. In many new mining regions, the cost of living is high because the food supply comes from a distance.

Commercial lumbering needs a considerable supply of labor, but not more than is usually available even in a new country. It attracts about the same sort of labor as does mining. When a country reaches the stage where reforestation is needed, then if it is a comparatively new country, like the United States, the labor supply may not be adequate; that is, what labor there is is likely to be more valuable at other work. The same is true in a more important way of the capital supply, to be discussed in the next section.

Agriculture produces most of its own supply of labor. According to the census of 1920, the farmers of the United States and members of their households did about three-quarters of all the farm work. Such products as milk, eggs and poultry, small fruits and truck crops are particularly the output of family labor. A large part of the hired labor supply comes from the neighboring farms; or as in the case of the South, was born and reared in farming districts. If the present northward migration of the negroes continues, Southern cotton growing will be severely affected. An agricultural product depending upon outside labor is beet sugar. Only in the Salt Lake Valley in Utah has sugar beet growing held its own while depending largely upon a local supply of labor. At present, the industry in other states is largely based upon an imported Mexican labor supply. Our Western grain growers have always depended upon labor obtained from the outside during harvest time; and also many of our fruit-growing sections.

Supply of Capital.—Until the World War, a very considerable part of the capital invested in our factories, railroads and mines came from Europe. Europeans were glad to invest their capital in American enterprises, because interest rates were higher here than at home. They were higher because capital was scarcer here. A new country usually has abundant natural resources, but insufficient capital to develop them. It takes time to accumulate a supply of capital in a new country; it all has to be saved out of the surplus above current consumption. The short-

age of capital and the high interest rates handicapped all American manufacturing somewhat, but especially manufacturing in certain sections. Local interest rates are nearly twice as high in Montana as in Massachusetts. They are high in all the southern states. They are two per cent higher in western South Dakota than in eastern South Dakota; and in northern Minnesota than in southern Minnesota. For large enterprises, however, eastern capitalists are willing to invest their capital in the West and South at only slight premiums.

Since the World War, American industry has come to depend almost altogether upon our home supply of capital. The tremendous profits of the war period and just following enabled us largely to pay off our foreign debts. Moreover, the war destroyed a large amount of European capital; and what surplus is now accumulating is greatly needed in restoration enterprises there.

Countries like China and India which are close to the margin of subsistence have very little surplus above present consumption. Hence no supply of capital accumulates, and whatever manufacturing is carried on is of the handicraft type, or is based upon foreign capital. Because of these circumstances, China is said to have large deposits of coal and metals still awaiting development.

Frequently a great deal of capital is needed to develop a mine to the producing state. And there is always some uncertainty as to whether it will ever pay back these development costs; and frequently there is a great deal of uncertainty about it. A certain geologist who specialized in ore deposits made himself very wealthy in one venture that turned out well; and invested a good part of his subsequent income in numerous other ventures, only two of which ever paid development costs. For this reason, capital for mining enterprises is sometimes very difficult to obtain. This uncertainty, coupled with lack of confidence in the governments, is what keeps back mining development in China, Turkey, Mexico and other countries.

Artificial forestry is particularly dependent upon the supply of capital and interest rates, for the reason that so much time elapses between the planting of the tree and the harvesting of the crop. When the forests are upon a continuous cropping basis, a portion of the cutting being done each year, there is an annual income to meet annual interest payments; but the total interest burden is no less. Thus far it is only in countries like those of Europe, with abundant labor supply, until recently a relatively large supply of capital, and a great need for lumber and wood products, that artificial forestry has been carried on

at comparative advantage even upon the rougher lands. Even in these countries, the government has to take a hand in it in many cases and assume the entrepreneurial risks.

Historical Reasons.—An area once started in the manufacture of a certain commodity will tend to continue in its manufacture even though other economic factors, such as sources of raw materials and fuel, transportation facilities, labor and capital supply, would warrant its moving to another area. The reasons for this are several, chief of which are the following: (1) Once the factories are built, it will pay to wear them out rather than abandon them and build new ones in another location. The same description applies in part also to equipment and transportation facilities. (2) A local supply of skilled labor has developed, and this labor tends to remain here at lower wages rather than move to a new area where wages are higher. Moreover, the factories starting in the new area are handicapped at the start because they cannot secure a supply of skilled labor, and consequently are not able to pay as high wages during the early years as later. (3) The buying public attaches considerable value to the goods manufactured in the long-established locations, and it takes some time to convince it that the products from the new area are as good as from the old, even if they are as good, which frequently is not the case.

The food and clothing habits of a people are for the most part determined for them by the food and clothing that are produced at comparative advantage in the region. But this is not altogether the case. The people of the United States, except in the South, do not eat a great deal of corn, although it is our principal food crop. Our wheat production is no doubt augmented by our wheat consumption. The Hindus refrain from eating beef because of religious traditions. Swine are barred by religious decrees from all regions under Moslem influence. In many regions of the Orient, the population would probably benefit by introducing potatoes as a crop for domestic consumption, and so far as climate and soil is concerned, potatoes could easily be grown. European peasants could live more cheaply if they substituted our corn for part of their black bread.

Summary.—It is apparent from the foregoing discussion that comparative advantage in agriculture is determined in a very important way by physical factors, such as climate, soil and topography, but by no means altogether by these. First of all, the external considerations must be taken into account, that is, the abundance of other areas with similar climate and soil and capable of producing the same

products, considered in relation to the demand for the product. Secondly, the density of the population determines the extent of the demand for locally grown food and clothing materials; likewise the customs and traditions of the people. The density of the population also determines the labor supply and to some extent the capital supply available for agriculture. Transportation advantages and distance to outside consuming areas are also of first importance, especially for bulky or perishable farm products. If only physical considerations were involved, Europe and the United States would be producing much more nearly the same farm products, or the same farm products in more nearly the same proportions, than they are at present. Moreover, wheat and wool would still be the principal farm products in New York state, in place of having moved on to Michigan, Wisconsin and finally to Wyoming, Montana and Idaho.

In applying the principle of comparative advantage to manufacturing enterprises, it is convenient to make the unit of comparison a city rather than an area or a single farm. Cities generally specialize in one or a few manufacturing products for which they have the comparative advantage because of nearness to sources of raw materials or fuel or to consuming centers. These products are usually but not always the ones which they can manufacture better than any other products or better than other cities. They are likely to be products which they produce and exchange advantageously for other goods which they need. Any manufactured product which has a location which is especially well fitted for it, like flour-milling in Minneapolis and Kansas City, and meat-packing in Omaha, Kansas City, St. Paul and Chicago, is likely to have first choice of these locations. In the case of cities, however, there is no ordinary limit to which locations cannot expand, so that there is room for almost any number of industries for which the city may be well situated. Moreover, the number of products to be manufactured is so large that any city of importance is sure to be manufacturing several of them. The reason that many products are manufactured in many cities is that the raw materials of these products are widely distributed. For example, live stock is available for slaughtering and meat packing over the major portion of the United States; likewise wheat for milling and milk for butter-making. At the same time, the consumers are even more widely distributed.

It is easy to see how the principle of comparative advantage works out in the case of mining. The mineral deposit itself and its geographical position are the primary considerations, but given two deposits

of equal grade and availability as to position, the economic factors will determine which will be developed and which will not. The location of supplies of ore, fuel, petroleum, stone and building materials, is of course merely a matter of geography. Economic considerations have nothing to do with it. But they do have a great deal to do with determining whether or not the deposits will be worked. As already pointed out, China has abundant mineral deposits which for the most part are not now being worked because of a shortage of capital and an unstable government, and Brazil has a large deposit of iron ore which will probably not be worked till the best of the ores in Minnesota are exhausted. As long as the Minnesota deposit lasts, prices will not warrant the transporting of the Brazilian deposits across the mountains and down to the coast.

The description for mining very nearly fits most commercial lumbering. Climate and rainfall and soil determine where the forests are located, and affect lumbering operations to some extent. But the quality of the timber and its geographical position determine much more than climate and rainfall whether it will be logged or not. When a country is well developed, and the original timber supply has been exhausted, then it begins to grow timber upon lands which come to be reserved for such purposes according to the principle of comparative advantage. For the most part, the lands so reserved are too rough or too sandy for farm crops,—the reason for this being that there is so much rough land in the world useful for very little other than this, that it is not necessary to resort to lands which have other uses. There may, however, especially in regions with little rough land near, be intermediate areas which will be given over to tree culture. In other regions, especially those with an abundance of rough land, grazing may take some such land away from forestry. A temporary shortage in the timber supply, such as is likely to occur in the United States in the next hundred years, may also cause land to be used for timber which eventually will be used for crops or grazing. The labor and especially the capital supply have an important influence in determining when and where artificial timber culture will be undertaken.

SUGGESTIONS FOR FURTHER READING

The student will find other discussions of territorial specialization in L. C. Marshall's and L. S. Lyon's *Our Economic Organization* (1921), Chapter XI; in F. W. Taussig's *Principles of Economics* (1921), Chapter 3, Sections 7 and 8; and in J. Russell Smith's *Industrial and Commercial Geography* (1922),

Part II, Chapter I. A treatment of certain phases of the subject is found in Alfred Marshall's *Industry and Trade* (1919), Book I, Chapter VIII. Almost every issue of *Economic Geography* contains articles bearing on the subject matter of this chapter. Particular reference is made to Olaf Jonassen's *The Agricultural Regions of Europe*, *Economic Geography*, October, 1925.

PROBLEMS

1. What is the meaning of mean annual temperature? Why is it not a good measure for comparing temperature of two regions?
2. Show that two areas with the same mean daylight temperature might have quite different temperatures.
3. The last killing frost in the spring and the first in the fall determine the length of the growing season. But two areas with the same average number of days between killing frosts may have different effective growing periods. Explain.
4. Why does a slope receive either more or less insolation than a level plain?
5. Show how humidity, evaporation and rainfall are all related as affecting many crops.
6. Cite cases where climate seems to be the determining factor in crop raising, live stock raising, lumbering, mining and manufacturing.
7. If the world's resources of soil, minerals, water, climate, etc., had been equally divided or distributed among countries of equal size, would there have been specialization (a) by persons? (b) by areas? (c) by countries? Explain fully.
8. Make a diagram showing the location of producing zones about a city having modern means of transportation. What would each zone produce?
9. The United States is producing less and less meat per capita. Alaska and northern Canada are developing large herds of reindeer, which will be an important source of meat supply. Does this mean that Alaska has an advantage in producing meat, or what does it mean? Explain fully.
10. How do you account for the fact that manufacture in China and India is largely of the hand type?
11. There is a tendency for each country to become more and more a manufacturing nation. Soon the whole civilized world will be like England and Belgium. Do you agree? Why?
12. Show how density of population may be either the cause or the result of comparative advantage for some industry.
13. What conditions will have to come to prevail before artificial forestry will be practiced to any great extent in the United States?
14. The raising of flax and production of linen has long been an important industry in Ireland. Does Ireland's advantage depend on soil, climate, labor supply, historical reasons, or what?
15. Do you think that there will be more or fewer greenhouses producing winter vegetables around Minneapolis in the future? Why?
16. Make a list of all the things that may affect the advantage of a factory location. How many of these must operate in order that the product will be produced there?

CHAPTER VIII

COMBINATION OF PRODUCTS AND SPECIALIZATION BY PRODUCING UNITS

In the preceding chapters, it has been tacitly assumed that each person or each area engages in only one line of production and turns out only one product. The question raised has been, By whom or where can this product be most advantageously produced? Now such an assumption is obviously quite contrary to the facts. It was made merely for the sake of simplifying the explanation in its early stages. It is now time to bring our explanation more nearly into keeping with things as they are. Many persons carry on two lines of work at the same time—for example, a lawyer is also a football coach, or a member of the state legislature; a newspaper reporter is also a short story writer; a banker also manages a farm. Many producing units turn out several products. The farm is an outstanding example of this. It is supposed to be one of the prime virtues of good farming to be "diversified," that is, to turn out several products. Probably a majority of manufacturing establishments have only one product, for example, automobiles, sugar, iron, or shoes. There are many, however, which make several products more or less related to each other, such, for example, as structural steel, car rails, wire and wire nails; or matches, toothpicks and paper pulp. Even in the case of shoe factories, although some make only men's shoes, there are others which make almost all kinds and types of shoes. Some furniture factories. make only chairs or beds, and some make a full line of furniture. Some bakeries make only pies, others only cakes, others only bread; and some make a full line of bakery goods.

There are two major questions arising out of such a situation, the first being *what products to combine if any*, and second, *in what proportion to combine them*. The principles relating to this constitute the subject matter of this chapter.

I. RELATIONSHIPS BETWEEN ENTERPRISES

In this textbook the term *enterprise* will be used to refer to the part of the business involved in turning out each separate product. Thus

a factory which produces baby carriages, chairs, sleds and coaster wagons will be said to have four enterprises. It is realized that the term enterprise is also used to refer to businesses as a whole. This double use of the term, however, seems to cause no confusion in this case.

There are involved in the combination of enterprises within business units three types of relationships, which are known as *the joint-product* relationship, the *supplementary* relationship, and the *complementary* relationship. It is highly necessary for an understanding of modern business that we have a clear understanding of them.

The Joint-product Relationship.—Enterprises that stand in the relationship to each other of using the same raw materials, like the coke and gas enterprises of a gas plant, or of coming part of the way at least out of the same production process, like wool and mutton from sheep, are said to be *joint-product enterprises*. Joint products occur very commonly in industry and agriculture. Flour and mill feed are joint products; also linseed oil and oil meal, butter and buttermilk, gasoline and kerosene, cotton and cottonseed, grain and straw. The cuts into which a carcass is split are joint products. The hides and tallow are joint products with the beef. In some cases, the joint products are linked in their production throughout the whole production process, as are the various cuts of beef; in some cases, one of the joint products is split off early in the production process, like the skim milk in a creamery receiving whole milk, and put through a production process of its own for most of the way. In the former case, the various joint products are almost unavoidably produced; in the latter case, the joint product may receive no further processing, either being thrown to waste, or marketed in its present form. Thus the skim milk from a creamery is sometimes run into a sewer, sometimes sold as skim milk for feeding purposes, and sometimes made into either skim milk powder, cottage cheese or casein. In the latter case, the joint products clearly represent separate enterprises. They have their own parts of the plant, their own equipment, and many of their own labor, management, power and supply expenses. In the former case, there can hardly be said to be separate enterprises; but the joint-product relationship is still there.

In cases where one of the products is more important than the rest, or represents the principal object of the production process, like flour from a flour mill, it is ordinarily referred to as the *main* product and the other products as *by-products*.

The Supplementary Relationship.—Enterprises that stand in the relationship to each other of making possible a fuller use of the same elements of production *other than the raw materials* are said to be *supplementary* to each other. For example, a wagon factory finds that it has a slack season when it cannot keep its plant running at full capacity, and installs a little additional machinery and begins to manufacture chairs. The wagon and the chair enterprises are supplementary to each other. Cottonseed crushers and refiners have in times past imported peanuts to keep their plants busy during the idle part of the year. A local grain elevator handles flour, feed and fuel, so as to provide work for the manager during the spring and early summer. We can say of two enterprises that one supplements the other in the use of labor or of building or of equipment, etc. In fact, it is usually advisable in speaking of an enterprise as supplementary to indicate with respect to which element or elements of production, and which product or products it is supplementary. Otherwise we may be understood as implying that it is supplementary in all respects.

Sometimes the enterprises that thus dovetail are of equal importance, so that neither one can be called the *main* enterprise. Sometimes, however, one is clearly the main product and the other is taken on largely to use up left-over labor or land or some other element of production. In such a case, as already explained, one is likely to refer to the first as the *main enterprise*, and the latter as the *supplementary enterprise*, or, more popularly, as the *side line enterprise*. Side lines, however, represent a rather high degree of supplementariness. There are some enterprises that one might call supplementary that one would hardly call side lines. For example, one hardly calls the soda fountain department of a modern drug store a side line any more, and yet it is clearly supplementary to the main business of selling drugs. The laundry agency maintained by a barber shop is clearly a side line; but not the manicuring department.

The Complementary Relationship.—Enterprises which stand in the relationship of contributing *products* to each other, are said to be complementary enterprises. Thus on the farm the crop enterprises provide feed for the live stock enterprises and the live stock enterprises in turn contribute fertilizer to the crops. Usually, however, the relationship is not mutual—one enterprise contributes a product to another and receives nothing in return. Thus the power enterprise ordinarily gets no product back in

return for the power it contributes to the rest of the plant. In such cases, it is customary to refer to the enterprise contributing its product to another as *the complementary enterprise.* Except in the case of power, complementary enterprises are not very common in industry and commerce. Manufacturers either buy their supplies, or else have them made in separate plants under separate management. Other examples in industry and commerce are the pattern shops of a foundry, the car shops of a railroad, the advertising departments of stores, the legal department of banks. In agriculture, however, the complementary relationship is still of very great importance and undoubtedly will continue to be so.

Summary.—In the joint-product relationship, the objective is the fuller use of the raw materials, the *materials worked upon;* in the supplementary relationship the objective is the fuller use of the other elements of production; of labor, the *active agent;* of the building and equipment, the *things worked with;* and the supplies, the *materials used up.* In the complementary relationship, the product of one enterprise becomes the *supplies* of another.

While the terms *joint-product*, *supplementary* and *complementary* as here used are names of *relationships*, in common practice they are applied to the *enterprises* involved in such relationship, and to the *products* resulting from such enterprises. The same is true of the terms *by-product* and *side line.*

Any one production unit may have enterprises of all three types. The ordinary retail store has all three types of enterprises. Some manufacturing plants become exceedingly complicated with many products closely interrelated in their production. For example, a plant for making car-wheel iron turns out twenty other products ranging from tar to kidney pills. To utilize certain otherwise waste products, a by-product is manufactured. But this needs certain supplies which can be produced very cheaply at the plant because of surplus power available at certain periods of the day, and this results in other waste products that can be utilized in turning out the main product, etc.

II. SUPPLEMENTARY ENTERPRISES

It will now be necessary to consider each of these three relationships in more detail. Let us begin with the supplementary relationship because it is most significant.

Reasons for Supplementary Products.—In many lines of production, it is not possible to produce economically and turn out

only one product. One principal reason for this is that a large part of production is more or less seasonal. Either the product is one, like farm crops, whose production the climate does not permit or encourage at all seasons, or one like clothing, whose demand is seasonal. If production is not shut off altogether during part of the year, it at least has a slack season. The building trades are a good example of production of this latter sort. With a seasonal product, a plant large enough to take care of the peak load will be used only partly or not at all during the rest of the year, unless some other use can be found for it at such times. The labor may be of such a type that it can be dismissed when the season is over and taken on again next year; but in many cases part or even all of it has to be employed for the full year. Or if not employed, the wages paid during the busy month must be high enough to tide the workmen over the idle ones.

In some cases, the reason for supplementary products is more nearly related to capacities of the production elements than to seasonality—the only way to keep a minimum-sized plant busy is to take on an additional product. This accounts for the fact that so many country stores are "general stores," and partly for the side lines taken on by many small establishments.

In other cases, only by combining two or more products is it possible economically to install certain types of labor-saving equipment. Thus a print shop may take on custom work as a side line in order to justify investing in a typesetting machine. Farmers commonly purchase threshing outfits, tractors and other equipment on this basis.

Sometimes it is economy in marketing that is responsible for combining products. Thus some of the meat-packing companies handle butter and cheese because they can ship them in the same refrigerator cars. Then having established a sales system so as to handle fresh and cured meats and oleomargarine and butter and cheese, why not have the system handle canned goods, breakfast foods, and any number of related lines?

Occasionally it happens that sidelines are established merely to make it possible to buy supplies more economically. For example, a local creamery buys salt in car lots and sells part of it to the public.

It is thus apparent that almost any element of production may become the reason for a supplementary product. It may be the fuller utilization of labor that is the objective, or of buildings, or of equipment, or of power, or of supplies, or even of management. And in

some cases the mere possibility of supplementary products causes additional production elements to be used.

The Nature of the Relationship.—In order to develop clearly the relationship between supplementary enterprises, let us first take a case where one is clearly a side line—such as the laundry agency maintained by the barber shop—and then afterwards some enterprises which are less supplementary. Under ordinary circumstances, taking on a laundry agency will add practically nothing to the costs of the shop—the space input, the labor input, and the equipment are the same after the laundry agency is acquired as before. To be sure, a little space is required, but ordinarily this amount of space can be spared without detracting in any way from the regular barbering business. Likewise a little extra labor is involved in taking in cash on laundry payments. But this delays the regular work of the shop so slightly that it is seldom noticed by the customers; and much of the time it causes no delay whatever. The same cash register handles this business as the regular business. The most important increase in input, and this is a very small one, is the increase in responsibility and supervisory duty assumed by the owner or manager of the shop. To summarize, it may be said that although the two enterprises *conflict* in their demand for space, there is ordinarily enough for both; that the same is true of management; and that so far as labor is concerned, they conflict part of time—when the chairs are all busy, for example—and part of the time not. (The terms "conflicting" and "non-conflicting" are convenient terms to use in discussing the supplementary relationship.)

In return for these slight increases in input, two kinds of income are received, one, the commissions, and the other, a certain amount of advertising and goodwill building. The laundry agency brings people to the shop, keeps them reminded of it, and wins their favor by the convenience of the service rendered.

One will at once ask: Why, then, do not all barber shops have laundry agencies? One answer is that the laundries do not care to have too many, because it means more stops for their wagons and more records to keep; and they keep the number down, in the first place, by offering to establish them only at strategic points, and in the second place, by making the commissions so low that the barber shops will not think the agencies worth while unless their volume of business is considerable. The other answer is that although the foregoing analysis fits the majority of barber shops, it does not fit all of them. There

are many barber shops that cannot really spare the extra space without crowding; or which are so busy with their regular customers a good share of the time, that they do not care to take out even the little extra time involved in receiving payments; or whose managers do not feel the urge of more income of this sort. The fact is, of course, that some packages are always getting lost or misdirected, and this causes considerable annoyance at times.

Any barber shop confronted with a proposal to install a laundry agency has therefore to make a decision as to whether or not it will be wise, and to make that decision on the basis of probable conflicts under its particular conditions. Some will find it wise, and some will not. Against the extra income and publicity and goodwill received must be balanced the extra inputs, which may be very slight in some cases, or appreciable in others, and a certain inconvenience to the regular barber customers.

Installing a manicuring department, in contrast to the foregoing, will probably require extra space in most cases, some extra equipment, and always extra labor. The manicuring enterprise will be supplementary only in that it will have the same management, and in part at least the same space—that is, rents will be somewhat less for either than they would if each department rented a place of its own. To determine whether or not it should install a manicuring department, a barber shop will need to weigh the extra space, equipment, labor and management input on the one hand against the extra income and goodwill obtained on the other hand. An important factor in determining how these factors will balance against each other will be the volume of manicuring business that is obtained, and the fit of capacity of manicurist and volume of trade that can be secured. If the manicurist is not kept reasonably busy, the venture can easily prove unprofitable.

Let us consider next a company whose regular business is the crushing of cottonseed and the extracting and refining of the cottonseed oil, during a season which lasts only a few months, but which by a slight re-adaptation of its plant and equipment is able to crush peanuts and refine peanut oil during two or three additional months of the year. Here you have two enterprises which are almost completely nonconflicting. The only possible conflict is that perhaps building and equipment cannot be adapted to both uses perfectly, or that both need oil-storage space while waiting for the market. Clearly, then, if any income can be realized from taking on the peanut crushing, it

should be done. However, the local supply of peanuts for crushing is hardly enough to figure greatly in the business. During the war when the European oil mills were largely out of business, a great many peanuts were imported from China and shipped to our cottonseed mills for crushing and refining. The present tariff on peanuts has stopped this practice.

As will be apparent, there are two ways of looking at the effects of making a combination of this kind. It may, on the one hand, be said that cottonseed oil is the main product, the product for which the plant was constructed, and that all inputs should be charged to it, so that anything realized from peanut oil above the additional labor inputs and the like should be credited to it as profit. On this basis, the plant will be willing to take on the peanut business at a very low margin.

On the other hand, it may be argued that both are main enterprises, and that each should stand its pro-rata share of costs. Building and equipment costs, it may be said, are spread over two products instead of one, and the unit costs for each product have been decreased. Total labor inputs have been greatly increased because of the extra period for which labor is hired; but labor costs per unit have probably been reduced somewhat for each, since laborers will usually work for a lower wage on a job that will last six months than on one that will last but two or three. On this basis, the plant will handle peanuts only at a considerably higher margin, and as a matter of fact, will not handle them at all most of the time, with the result that all the inputs are charged to the cottonseed anyway. It will be apparent that the second way of reasoning does not fit any case in which either the peanuts or the cottonseed is a minor enterprise which can be dropped at any time. A more plausible way of stating this second argument is to say that the plant would never have been built if it were not for the probability of securing peanuts to crush as well as cottonseed; therefore some of the inputs should be charged to the peanuts. But the question is, how much? This is a difficult question which is discussed at length in other courses in economics.

Another combination of enterprises that might be analyzed at length is that of the buying of grain and selling of feed, flour, fuel and other supplies by a local grain elevator. Ordinarily some extra building space is required for the supplies department, the same space being used for the rest. The seasonal factor enters here. The grain buying keeps the elevators very busy for two or three months in the fall, only partly busy for four or five months more, and leaves them almost idle

for the rest of the year. Many elevators are closed for three to six months of the year. When the grain business is heavy, the side-lines conflict in the use of space; at other times not. And some of the side lines—coal, for example—need a special kind of space; for these there is no space conflict at any time during the year.

The two enterprises also conflict, and rather seriously, in their need for labor during the busy season for grain. This is especially the case with coal, because the farmers are likely to want to haul their coal home in the fall as a return load after delivering grain. The elevators meet this situation by hiring extra help during this busy season, which they are usually able to do satisfactorily. Handling the sidelines on this basis thus leaves the regular employees, especially the manager, with a steady year-round job, and actually reduces the per-unit costs of labor and management.

The Supplementary Relationship in Agriculture.—Probably the most supplementary type of business known is the typical diversified farm of the central and eastern part of the United States. There is scarcely an enterprise on such a farm that does not supplement some other in the use of most of the elements of production. All of them supplement each other in the use of most of the man-labor and horse-labor. They supplement in the use of some of the machinery and even in the use of land. Some of the enterprises supplementing each other are of almost equal importance, as for example, the corn, oats and hay enterprises on many farms. Others are more nearly side lines, such as the poultry enterprise, and often the dairy enterprise. Also certain farms in many sections have a small acreage of some "pin-money" crop, such as beans, or cucumbers, or sugar beets, to provide occupation for the available family labor.

The principal reason for the supplementary character of the farm business is the seasonality of the work. The other reason for it is the supply of family labor available. Let us take an ordinary diversified farm in the northern edge of the corn belt as an example. In the winter months, the only labor is that of caring for live stock, hauling produce to market, cutting the year's supply of fuel (if the farm has a woodlot), getting seed ready for the spring planting, and repairing the machinery needed in the coming rush season. If the farm keeps no live stock other than work horses, there is really very little to do in the winter. A certain farmer when asked what he did during the winter time is said to have replied: "Oh, I sit by the stove and think—and sometimes I just sit."

As soon as the land is ready for working, it is prepared for sowing and the oat crop is planted—and on some farms barley in addition. Next, all energies are devoted to getting the corn planted. This is followed by corn cultivating and haying. If the corn is planted in good season, there may be a little respite between planting and the first cultivation. But many farmers use this for weeding their corn. Haying and corn cultivating run simultaneously and keep the farmer busy till the oat harvesting begins. This and the threshing, and on many farms the cutting of wild hay on marshes, keep the farm labor force busy till the middle of August or later. If all this work has been done in season, there is usually a respite of a few weeks before the corn harvesting begins. This is used for fall-plowing, for getting land ready for sowing rye, or winter wheat on farms a little farther south, for manure hauling and for odd jobs of building and repairing, and draining and clearing land, which need to be done during the summer. Once the corn harvest begins, everybody is busy till November, and if any time can be spared, it is used for more fall-plowing. All during the summer months, the live stock has been cared for. But the live stock requires much less work in summer than in winter, since most of it is on pasture. If the dairy enterprise is important, however, and the cows are milked most in the summer season, there may be considerable conflict between the live stock and crop enterprises in the summer. The tendency is to avoid this conflict either by keeping beef rather than dairy cattle, or by having the cows in full milk during the winter months, except on farms where family labor is available to do the milking.

It is thus apparent that there is not a great deal of conflict in the demand for labor on such a farm. There may be a little conflict between corn cultivating and haying; but ordinarily there is enough labor available to do both. There may, of course, be individual days when weather conditions produce serious conflicts between haying and corn cultivating; but there will not be many of these. Corn harvesting and fall-plowing also conflict, but there is time enough in most autumns for both. Chores and field work conflict somewhat in the summer months on many farms; but not seriously if family labor is available. The most serious defect in the farm organization is the slack winter season. Farmers handle this in many cases by hiring labor for the crop season only. The busiest periods of the years on such farms are the corn planting, threshing and corn harvesting. Extra day labor and month labor may be hired merely for these busy

periods. The rates are high when labor is hired for short periods; but it may easily be cheaper to hire at these high rates than to pay lower rates over periods when the labor is not needed. When all the work is done by the farm family, there is a good deal of idle time during the year.

Horse-labor on such a farm supplements for the various enterprises in much the way that man-labor does. The busiest periods are corn planting and grain harvesting. One important difference between the horse-labor and man-labor problem is that enough horses must be kept the year round to handle the work of the few busiest weeks—horse-labor cannot be hired for a few days now and then. This means a great deal of idleness for the horses. On most of the farms in this region, the horses average less than 5 hours of work per day.

Some of the farm machinery is specialized—*e. g.*, the corn harvester—and some of it is used for all crops—*e. g.*, plows, harrows, wagons, etc. There is ordinarily little conflict in the use of machinery.

The principal farm buildings are ordinarily constructed so as to serve several of the enterprises at the same time. Space for horses, cattle, and hay and feed storage is provided more cheaply in one building than in several. Thus these enterprises are supplementary to some extent in the use of barn space.

The principal conflict on a farm is in the use of land. Land cannot be used for corn and oats and hay at the same time. Even in this respect, however, there is a considerable amount of supplementariness. Corn and oats and hay can be grown better in succession than continuously on the same piece of land. Land becomes weedy if sown to oats year after year. Cultivating the corn crop kills off the weeds. Furthermore, these three crops do not all use the same proportion of the different plant foods in the soil. One of them uses more of a particular plant food that another uses less of.

Many farms in this region take on certain additional enterprises mostly for supplementary reasons. If there is an abundance of family labor, more cows may be milked, or more poultry kept; or sugar beets or potatoes may be grown; or a canning crop, like peas or sweet corn or beans or cucumbers; or fruits and vegetables for the local market; or seed corn for sale; or road work or hauling may be done during the winter months, etc.

The Supplementary Relationship in Retailing, etc.—The ordinary retail store is also much affected with supplementary relationships. Strictly speaking, all of the different lines of goods

handled are supplementary to each other. They are supplementary in the use of space, labor, management, delivery trucks, supplies and nearly all of the various production elements. There are some of them, however, which are more nearly side lines than others. The ordinary drug store with its stationery, toilet accessories, cigars and tobacco, soda fountain and candies is an interesting example of palpable supplementary enterprises; or the lumber yard that handles flour, feed and fuel. So far as labor is concerned, different commodities handled have different seasons or hours of the day when customers call for them. Combining a large number of commodities also gives enough volume of business to keep at least one salesman busy most of the time, and perhaps several of them. It also makes possible a more economical utilization of space. Many small retail establishments are also family enterprises, and business and household duties are dovetailed with each other in such a way as to keep down the time required for each. Moreover, the store provides work for some members of the family that otherwise would have nothing to do. The store business is thus combined as a supplementary enterprise with the job of rearing a family. Of course this same analysis fits the farm family unit also. There is no doubt a certain amount of conflict between going to school and working in the store or on the farm, but it need not be serious. The conflict with time for much-needed play is oftentimes more serious.

A household represents a combination of a good many different kinds of work, but very few of the products are really supplementary. They are combined mostly for other reasons than to secure a fuller utilization of production elements. If rooms are let, however, or boarders are taken in, then these are supplementary enterprises. In some parts of the world, a good deal of sewing and hand work of various kinds is done in homes instead of in factories. This is all supplementary work.

The principal example of supplementary products in the case of individuals is the work done outside of regular working hours, usually of a somewhat different sort from one's regular work, either to increase one's income, or promote one's individual progress, or for the sake of variety. In the aggregate, a very considerable part of the work of the world is done in this way. Most active men have an avocation in addition to their vocation, even if it is nothing more than looking after their home.

III. BY-PRODUCT ENTERPRISES

As already indicated there is a considerable range in the importance and the likelihood of by-products, and in the amount of extra organization necessary to turn them out. Some by-products are so nearly of equal importance with the main product that it is rather beside the point to call them by-products. Examples of these are the illuminating gas and coke made from coal, the milk and beef from "dual-purpose" cattle, and the wool and mutton from dual-purpose sheep. At the other extreme are by-products of very minor importance, such as the sawdust from a saw mill, the bones and bristles from a meat-packing plant, and the straw from grain. Between such extremes are the cottonseed from cotton, the hides from cattle, and the important petroleum by-products. Similarly there are some by-products which are ready for sale in the original form in which they come into existence—like cottonseed, hides, sawdust, buttermilk, etc.—and others which must be converted into another form before they can be sold—like the soap and cleaning compounds made by meat-packers, the cider and vinegar made from cull apples, the starch made from small or cull potatoes, the ammonium sulphate made by coke plants, the dyes made from coal by-products, the cottage cheese made from skimmilk. Those which are ready for sale in their first form come into existence as a matter of necessity. As long as the main product continues to be manufactured, the by-product will be forthcoming. Nothing can stop the production of the cottonseed except stopping the production of cotton. The same is true of hides, sawdust, straw, and to a considerable extent of coke. The only alternatives under such circumstances are to sell the by-product, or let it go to waste—or if it is on farms, feed it to live stock, which really means putting it through a subsequent production process before it is ready for sale.

By-products which must be treated further or converted before they can be sold, introduce a further complication. The converting of the by-product requires additional expenditure for labor, equipment, supplies, etc. For example, the cottonseed needs to be ground and the oil pressed from it; the oleo oil needs to be extracted, refined and combined with other materials before it is oleomargarine. The sawdust must at least be loaded into cars. The by-product must sell for at least enough to pay these additional expenses if it is going to be manufactured.

It is very easy to make a mistake in reasoning in computing the extra costs of manufacturing a by-product, for the reason that most by-product enterprises are to some extent supplementary also. For example, the same building may house both the main and the by-product enterprise; or the same management supervise both; or the same equipment in part handle both; or the same sales system; or the labor of the by-product enterprise may so dovetail with that of the main enterprise that the effect is partly merely to give a fuller utilization of the labor. Where by-product enterprises are in part supplementary, the usual procedure is to *consider only the extra costs as due to the by-product enterprise.* This is no doubt a correct procedure, except in cases where the by-product enterprise is of considerable importance. When it is, it must be remembered that probably the whole business never would have been started, or could not continue in operation, were it not for the two incomes, the main product income, and the by-product income. In such cases, surely it would be giving the by-products an undue advantage not to divide building, equipment and management and other such expenses between the two enterprises.

In many cases, another aspect of the problem, although a minor one, needs to be considered. It frequently costs something merely to dispose of waste products. Some creameries have difficulty in selling buttermilk at any price and have to go to the trouble and expense of pumping it out of the plant and draining it into a river or lake. Mines and ore-dressing mills have to buy land upon which to store their waste rock and sand. In such cases, this cost of waste disposal should be subtracted from the cost of conversion, since it is saved if the waste is made into a by-product.

Sometimes the by-product is sold by the original producer, and converted by someone else, as is cottonseed; and sometimes it is converted at the point of production, as are packing-plant by-products. So far as the analysis goes, it may make very little difference which procedure is followed; the same costs will be involved in both cases. But sometimes the supplementary relationships are different; for example, if the by-products are converted by the producer of the main product, the same building, management and the like may be used in part for both; whereas if converted elsewhere, special buildings will be erected and special equipment installed. This may look like additional expense; but it may be more than offset by the gains from a high degree of specialization in manufacturing and selling, and from

the large volume that may be assembled at this point. Thus the several creameries in Minneapolis and St. Paul are selling all their buttermilk to a special by-products plant instead of manufacturing and selling it themselves. Transportation is of course an important factor in determining which is the more economical. Usually the manufactured products are less bulky than the raw products.

As was explained earlier, by-products are merely a form of joint products. It is frequently impossible to state definitely whether a given product is simply a joint product, or in addition that special form of joint product that is called a by-product. To illustrate, let us take the case of a sawmill. A log is ordinarily cut up into several kinds of lumber—perhaps into 12-inch planks, 2-by-6's, 2-by-4's, and laths. The planks probably sell for the most money per board foot, the laths for the least (other costs being the same), because there is less timber available from which 12-inch planks can be cut and more from which laths can be cut. The latter, in fact, are largely made from slabs too small to cut into larger dimensions, or from very small logs. One might be disposed in many cases to call the laths a by-product; but not the other cuts of timber. The same circumstance occurs in a slaughtering establishment. The usual cuts of meat are looked upon as joint-products. Whenever a product is of different type or form from the main product—lard as compared with pork—it is likely to be called a by-product, unless it is of nearly equal economic importance, as in the case of gas and coke. Also, whenever a conversion process is required—*e. g.*, the trying out of lard—the resulting product is likely to be called a by-product. For joint products which are not of the by-product type, there is never any question as to whether or not they will be produced. They cannot help being produced. No doubt the state of the market is important at times in determining whether a certain joint product is or is not a by-product. Time was when liver, for example, was looked upon as a by-product. To-day it is probably put in the same class as the regular cuts of meat.

The by-products of many lines of production are of great importance. The dye industry of Germany is largely a by-product industry. In 1915, the by-products of beef animals handled by the large packers sold for enough to pay for the whole cost of marketing and transporting and packing of the animal and dressed beef clear through to the consumers.

IV. COMPLEMENTARY ENTERPRISES

The complementary relationship, it will be remembered, occurs when one enterprise contributes some element of production to another, usually some form of supplies. Obviously the more complementary enterprises there are, the more nearly self-sufficing the unit is. Hence complementariness and self-sufficiency mean approximately the same thing. In the manufacturing world, numerous illustrations of complementary enterprises are not to be found. Most manufacturing plants find it cheaper to buy their own supplies than to attempt to produce them themselves. To illustrate, if a print shop undertook to manufacture its own paper, or a photographer to make his own plates, these enterprises would be complementary. It is easy to see in these extreme cases that it would be foolish to take on the complementary enterprises. But a chemical plant needing a great deal of acid might manufacture it very advantageously along with its other chemicals. The plant might easily be in an especially favorable position for manufacturing its own acid, and hence able to produce it more cheaply than it could buy it. It might even be that the acids could be made largely from materials left over from some other chemical process, and hence that these two processes would be mutually complementary. An enterprise recently projected illustrates this relationship. The heat needed to drive off the gas from lignite, and the power to press the lignite into briquettes, is to be provided by burning the gas thus driven off. To be sure, the product does not have as many heat units in it as the original lignite; but it has as many heat units of the sort that can be utilized in an ordinary domestic furnace.

The reason that a majority of manufacturing plants produce their own power is that power is not a product which can be bought and sold and transported readily under all conditions. Electric transmission, however, has done wonders in recent years, and more and more plants are buying their power each year. No doubt many plants can produce power more cheaply than they can buy it; but this is decreasingly the case. Plants located close to water power will always produce their own power, and most large plants; but smaller plants, and those using power only a few hours per day, will depend more and more upon electric power.

A practice somewhat resembling the maintenance of a complementary enterprise is that of producing supplies in another plant under the same control. Thus a large mail order house produces the paper for

its catalogues in its own paper mill in northern Wisconsin; an iron products company obtains its kiln wood from its own forests; a fruit marketing organization produces boxwood in its own mills. It will be noted that in this case the complementary product is produced in a different plant—the only thing that is the same is the control and the general overhead management.

As already stated, the best examples of complementary enterprises are found in agriculture. For example, the farmer produces nearly all of his own seed. There are several reasons why he does this. First, the seed for next year's crop is in most cases a very easily obtained by-product of the crop of the year before. In many cases, very little if any selecting or special treatment is necessary. Second, if the farmer uses his own seed, he knows exactly what he is planting. Third, his own seed is from a strain that has become more or less acclimated to the region in which he is farming. Fourth, he saves the cost of transportation and merchandising. Fifth, the labor of selecting and preparing the seed for planting can mostly be done at times when there is little else to do on the farm. The seed is therefore partly a supplementary product. Perhaps a sixth reason is that if he depends upon an outside supply, some years this supply may fail him. Thus, for all of these reasons, there is a tendency for farms to be self-sufficient in the matter of seed for crops. This is only a tendency, however, and is counter balanced by the advantages of specialization which may be so great that in many cases the farmer does not grow his own seed, but lets a seed specialist do it for him.

Farms also tend to be self-sufficient in the matter of feed. Farmers cannot usually buy most of their feed and compete successfully with those who grow most of it. The reasons for this are much the same as in the case of seed, the most important ones being the great saving in transportation and merchandising cost, and the fact that much of the labor, land and equipment used in growing the feed crops would not be utilized at all if these feed crops were not grown. If a wheat farmer, for example, grew nothing but wheat, his horses and much of his man-labor would be idle a good part of the year. He can grow hay and oats to feed his horses, and perhaps some corn in addition for cattle, without hiring much extra man-labor, and with no extra horses. In other words, the feed crops are supplementary products. These are frequently supplementary in the further sense that many farms have land which is well suited only for the growing of feed crops. The feed bill of the average farm in the United States at the high prices of 1919 was only $170.

An even clearer case of self-sufficiency on the farm is that of horse-labor. Few farmers indeed hire the horse-labor they need. The reasons for this are, first, that horses can be kept at relatively small expense on a farm, the feed and labor being largely supplementary, second, that the farmer must have horse-labor exactly when he wants it, and could not depend upon an uncertain outside supply, and third, that procuring horse-labor whenever it was wanted would be a great trouble and expense.

The same reasons apply in the case of machinery. The farmer almost invariably maintains his own supply of wagons, plows, harrows, planters and harvesters. But he usually depends upon an outside threshing outfit and hay-baling outfit. There is an ever-present tendency, however, for farmers, or small groups of farmers, to have their own threshing outfits. This is because they wish to thresh when they are ready and do not care to wait for their turn with somebody else's outfit. This is especially the case with silo-filling outfits. Corn is exactly fit for the silo only at a certain stage, and the farmer cannot afford to wait a week for his turn.

One of the most important complementary relationships in a farm is that between crops in a rotation. Thus a small grain crop serves as a nurse crop for the clover crop which follows, and the clover crop adds nitrogenous plant food to the soil, which is particularly needed by the corn crop which comes next in the rotation.

A farm enterprise needs fertilizer. By feeding his crops to live stock, a farmer can produce beef, dairy products, pork, mutton and wool and secure a supply of fertilizer at the same time. Thus arises the complementary relationship between the crop and live stock enterprises. It can hardly be said in such a case that the crop enterprises were added to furnish supplies for the live stock enterprises. Historically, the development was most frequently the very opposite of this. But the live stock enterprises had to be added before the crop enterprises could be complementary.

The farm is self-sufficient even in the additional sense of providing a large part of its own supply of man-labor. According to the 1920 census, only 22 per cent of all the persons reported as gainfully employed on farms in the United States were hired laborers, and the farm wage bill of all the farms in the United States in 1919 was $1,356,000,000, or $210 per farm. At the wage rates of 1923, the average wage bill would have been $168. The reasons for this, it will be obvious, are not quite the same as in the former cases. In fact, a fairer state-

ment is the reverse of the foregoing, namely, that the farm business is adjusted so as to utilize a supply of family labor which is available largely for other reasons.

The gross income of the average farm in the United States in 1919 was only $2500, even at the high prices of that year. This seems like a very small amount. But it must be coupled with the fact that the average expense bill was only $605, exclusive of hired labor.[1] The expense bill is low because the farms are so largely self-sufficient, and expenditures for feed, fertilizer and other supplies are kept so low.

When we consider the family side of the farm unit, we find a still larger measure of self-sufficiency. A study made in 1913 of 950 farms in 14 different states showed an average of $424 worth of food, fuel and shelter furnished by the farm, as against $218 spent for food and fuel.[2] A study of 402 farms in Livingston County, New York, gave the following results: Food, fuel and light and shelter furnished by the farm, $682; food, fuel and light and clothing purchased, $853. These latter farm families produced half their own food, 41 per cent of their fuel and light, all of their shelter, and none of their clothing.[3]

The self-sufficiency enterprises which provide directly the supplies needed for the family living are of two types, those which are taken on principally or entirely for the sake of providing for the family, and those which produce primarily for the market, but incidentally for the family at the same time. The family supplies obtained by a retailer's family, or a tailor's family, or the vegetables consumed by a truck-grower's family, are examples of the latter. The family garden is an example of the former. The poultry enterprise on many farms is about midway between these two types, providing merely for the family part of the time, and producing a commercial surplus at other periods.

On the service side, farm families are also mostly self-sufficient. The only services bought are those of doctors, dentists, lawyers, teachers, entertainers and preachers. Farm households do most of their own baking, sewing and washing. The family itself provides practically all of the domestic labor.

[1] *Distribution of Income by States*, p. 18, by O. W. Knauth.

[2] *Value to Farm Families of Food, Fuel and Use of House*, W. C. Funk, U. S. D. A., No. 410.

[3] *Standard of Life in a Typical Section of Diversified Farming*, E. L. Kirkpatrick, Cornell No. 423. In this study as well as Funk's, the supplies furnished by the farm were valued at the farm. A true comparison would require that both be valued at the same place. City values are nearly double farm values on such products.

It is easy to see why farm families are as nearly self-sufficient as they are. In the first place, there is ordinarily enough family labor available to tend to all the household work, and much of the garden and poultry besides. In the second place, the only way for a farm family to have an abundance of fresh fruit, vegetables, poultry and eggs, is to produce them at home. Third, some of these, especially milk, cream, butter and eggs, and frequently potatoes and fruit, are produced for market, so that a supply for the family is readily available. The fuel supply is largely a waste-land product.

The degree of self-sufficiency varies greatly in different countries and even in different states. In a California county studied in 1913, over half of the food, fuel and shelter was purchased; in a New Jersey county, 44 per cent; in a North Dakota county, 39 per cent; in a Wisconsin county, 31 per cent; in an Ohio county, 26 per cent; in a Georgia county, 18 per cent; and in a North Carolina county, 15 per cent. The Russian peasant family is even more self-sufficient than a southern family in the United States; and a Hindu family even more than a Russian peasant family. Our pioneer farm families were more nearly self-sufficient than are our present farm families. The least self-sufficient of our farm families are those which produce a single commodity for the market, such as our wheat farmers, our sheep ranchers, our fruit farmers and the like.

Next in order of self-sufficiency of our institutions is the urban household. It still performs most of the domestic service it requires, although more and more of the cooking, sewing and washing is being done outside the homes. The determining factor in this case is largely the amount of labor available or obtainable.

Factories, on the other hand, are very little self-sufficient. In most cases, they buy all their supplies. Exceptions to this are metallurgical plants manufacturing their own fluxes, chemical plants producing their own acids, manufacturing plants producing their own power, etc. As for services, most manufacturing plants buy fire and accident insurance, market news service, advertising service, auditing service, legal services and the like. Some also hire their drayage and trucking service.

The complementary relationship, like the other relationships, seldom exists entirely by itself. While the corn and small grain and live stock enterprises are complementing each other, they are also supplementing each other. The corn, oats and clover require both horse-labor and man-labor at different periods; and they use some-

what different proportions of the different plant foods. The power enterprise supplements the other enterprise in many cases by combining with it in a more economical utilization of space and management; or in small plants, by combining with it in the use of labor. In other cases, the power enterprise is in part a by-product enterprise in that it consumes wastes from the other enterprises as fuel. This is true of most wood-working establishments. It should be pointed out that the self-sufficiency enterprises of farms and households are also supplementary in large measure. The labor upon them is performed largely by members of the family that would not otherwise be so busy, or at odd times when the regular work is not driving. From one point of view, the whole combined family business may be looked upon as made up of two enterprises, the regular business enterprise, and the household enterprise. The business enterprise furnishes supplies to the other in the manner explained, and in turn the family enterprise complements the business enterprise by supplying it with family labor.

V. THE PROPORTION BETWEEN ENTERPRISES

The discussion thus far has brought out the general relationships between enterprises, but has said nothing about the way in which these relationships are affected by the relative size of the enterprises. Let us illustrate this by the case of supplementary enterprises. Very frequently a small supplementary enterprise conflicts very little with the main enterprise, while a large one conflicts very seriously. Somewhere between those two extremes is a size of supplementary enterprise which is just right. If it were smaller, it would not add as much to the total income as might be; and if it were larger, it would reduce the income from the other enterprise more than the increase from the supplementary enterprise would amount to. Of course not all the elements of production are affected alike. The supplementary enterprise may be completely non-conflicting on its expanded basis so far as horse-labor is concerned, but it may be conflicting seriously in man-labor and land. It is, of course, the *combined effect with all the elements of production that must be taken as the criterion of the proper size of the supplementary enterprise.*

VI. RELATION OF COMBINATION OF ENTERPRISES TO COMPARATIVE ADVANTAGE

So far as the discussion in Chapters V and VII is concerned, one would expect only one product to be produced in one area, and that

product would be the one that has the comparative advantage. On the basis of the analysis in these chapters, we would say that surely at any one time in any one area, only one product could have comparative advantage. We might admit the possibility of two products having exactly equal advantages, but we would expect this rarely to happen. But this, we now know, is not in keeping with the facts. The corn belt of the United States does not produce corn only, but oats, hay, pork, beef, and dairy and poultry products in addition. Most of these are produced even on any one farm. The reasons that these other products are produced is that they supplement or complement the other products, or are by-products of them. There thus appears to be an inconsistency between the principle and the practice. It is, however, only an appearance. The fact of the matter is that *supplementary, complementary and by-product relationship are factors in comparative advantage.* A product which supplements another, or several others, has this for an advantage in production; likewise one which complements another, or is a by-product of it.

It may be well to relate this type of advantage to the others already discussed. Take the supplementary relationship first. By definition a supplementary product is one which uses elements of production not needed by other products. If they are not needed by other products, then no question of comparative advantage arises. The *two products are non-competing* with respect to each other. Either or both may be competing with some other products; but the two are not competing with each other. One may use the labor force in April and July, and the other in May and September. In such a case, the amount of labor used by one does not affect the amount used by the other. If labor were the only element needed to produce these two products, either could be produced up to the full amount that the labor force could handle during April and July in one case, and during May and September in the other case.

Actually, however, two products seldom are completely supplementary. They may be entirely supplementary so far as labor is concerned, but conflict in the use of land. The more land that is planted to corn, the less that is left for oats. They may need labor at the same time part of the year, and at different times another part of the year. To the extent that they do conflict, there is a comparison between them of the advantages discussed in Chapter VII; and during the period of conflict, one of the two products will have the advantage over the other in respect to the factors mentioned in Chapter VII.

Also if one enterprise expands, the other must in most cases contract. It always must if the conflict involves land or buildings, and frequently if it involves labor and management. A certain amount of winter wheat can be grown upon a farm without conflicting with the other small grain or corn; but if the acreage is increased, the wheat and corn, or wheat and barley, may be wanting the man-labor, horse-labor and equipment at the same time; or the wheat will be using it in place of the corn or barley that would have been grown upon the same land. This also will bring in a comparison of the advantages between products mentioned in Chapter VII; and one of the products will always have the advantage over the others so far as these factors are concerned.

It thus turns out that any particular product may be greatly favored on the one hand by requiring labor or some other element of production at a time when no other product can use it; but at other periods find itself competing with some other product which has advantage over it in all other respects. Thus the oat crop may find itself conflicting little or none with the corn crop in the corn belt so far as labor and equipment are concerned; but so far as climate is concerned, corn may have a distinct advantage. A flour mill may be especially designed to grind patent wheat flour, but for short periods when the flour market is dull, breakfast foods may have an advantage. Furthermore, the relative sizes of two enterprises, one of which is partly supplementary to the other, determines the relative advantages of the two. A fairly small breakfast food enterprise may enjoy equal advantage with flour milling; but let it become too large and it will be at comparative disadvantage with the flour milling. Thus by shifting the relative size of the two enterprises, it is possible to keep them at equal advantage. For all these reasons, in any producing unit turning out supplementary products, in place of having one enterprise at comparative advantage over all others, *the normal situation is for all to be at equal advantage with each other, and for the proportions between them and their relative prices to be so adjusted as to keep them all at equal advantage.*

A similar statement can be made for complementary and by-product enterprises. Complementary products have their other disadvantages relative to the main products offset by the fact that they have a market very close at hand, right in the same establishment. Up to the point where all of a complementary product can be consumed in the same establishment, the advantage from this may offset the

other disadvantages. The proportion between main and complementary enterprises therefore becomes significant just as in the case of supplementary enterprises. And if the proportion is right, advantage will be exactly equalized between them. Those particular complementary enterprises which furnish products for family use may have the further advantage of providing a better quality of product, or a special quality of product that is desired, or furnishing the product exactly when it is wanted. This is true of the supplies which the farm furnishes the farm family. The special advantage which by-product enterprises enjoy is that they obtain their raw materials in effect free of all cost, or ordinarily at very low cost. Frequently the materials used would have no other use unless so utilized. This advantage may very easily offset all the other relative disadvantages up to the point of a full utilization of the by-product materials; or if the price of the by-product is too low, part way toward a full utilization of them. The proportion between enterprises is again the significant thing.

VII. SPECIALIZATION *vs.* DIVERSIFICATION

Taking on supplementary, complementary and by-product enterprises, however, is surely going contrary to specialization. Complete specialization means turning out one product only. A creamery which makes butter only is strictly specialized. Just as soon as it begins to sell buttermilk and skim milk, it is no longer strictly specialized. If it begins in addition to sell cottage cheese, ice cream, milk and cream, as some creameries do, it is still less specialized. The plants which turn out a varied list of products with the least apparent relation to each other, like some of our "diversified" farms, like our general stores, like our novelty manufacturing plants, are least specialized. Specialization is a matter of degree. The least specialized are specialized a little, and the most specialized are almost altogether specialized. Each producing unit can be placed somewhere along the way between these two extremes. In talking about the advantages of specialization for individuals or producing units, we must therefore compare degrees of specialization, a high degree of specialization with considerable amount of diversification. It thus develops that comparative advantage gives us diversification in place of specialization in many cases.

Specialization as to persons is probably most complete among professional men; as to areas, between regions which have only one avail-

able natural resource, such as minerals or timber or semi-arid pasture; as to producing units, between factories turning out a single product as many factories do. Professional men, such as lawyers, dentists and physicians, buy every kind of supply or service that they need. The same is true of shopkeepers and merchants. Such men, however, occasionally take on a supplementary enterprise or two outside their regular business. For example, an attorney handles insurance and real estate, or a photographer in a small town sells life insurance as a side line, or an eminent physician teaches a course in a medical school, or a small-town business man manages a farm. The reasons for this may be numerous, chief of which are the following: time left over from regular work, desire for variety, interest in the side line project, need for additional income. In their personal and family affairs, individuals are not generally so specialized. In the first place, most individuals handle their own investments, many do their own buying and selling of real estate, and nearly all buy their own household supplies and equipment. Not only farm families, but many city families have their own gardens. Many heads of households do most of the repairing of the house and of household equipment. The reasons for their doing these things are numerous and varied: it is frequently easier to do them themselves than to explain to others how they are to be done and then to keep watch to see that they are done right; or they can never be sure that they will be done right unless they do them themselves; or the expense of having someone come and do them is prohibitive because of the time and expense of traveling to and fro; or it is so important that they be done at once that one cannot depend upon outside help; or the individuals concerned have time left over from their regular occupation which they can just as well use in this way as not; or they are glad to do a little work of this kind as a change from their regular work.

A farm business usually consists not of one main enterprise which is carried on at comparative advantage, but of this and several supplementary enterprises and by-product enterprises carried on at somewhere equal advantage with it. Thus diversification is the rule in agriculture rather than specialization. In the manufacturing world, on the other hand, specialization is the rule.

In most industries there is always an issue between more diversification and more specialization. The influences that are particularly favoring more specialization at present are the following:

1. The gains from concentrating individual effort on one product—

improved technique and skill, better understanding of the problems, etc.

2. Increasing size of business enterprises, making it possible to develop a high degree of division of labor in the manufacture of one product.

3. With only one product to make, plant and machines, and for that matter, the whole organization, can be made to fit exactly the needs of this product. A plant which makes butter part of the year and cheese the rest of the year cannot be ideal for either. The building itself will probably not be the most economical type for either. The rooms and floor space will not be ideally arranged for either. The equipment used in common by the two processes will probably not be well suited to either.

4. The difficulty of managing a large enterprise handling a miscellaneous lot of products. The manager of a certain large marketing organization is said to be very skillful in the selling of apples; but his organization is trying to sell potatoes, peaches and several other products, and is not having very good success with some of these. It would be rather difficult to have one man really supervise the selling of all these different commodities, giving necessary attention to details, without making a good many mistakes.

5. Improving transportation facilities and the like is giving more opportunity for geographical advantages to produce their efforts. Complementary enterprises are therefore tending to be displaced.

The particular influences that are favoring diversification are the following:

1. Increasing tendency to dovetail enterprises so as to secure full utilization of labor and other elements of cost, partly due to the present relatively high wage rates and rents. This accounts for the recent development of the drug store lunchroom.

2. Desire to reduce risks from bad weather, uncertain markets and the like. The by-products of some factories carry them over brief periods of depression. The corn crop and the oat crop seldom are both poor in the same year.

3. Technical developments making it possible to utilize by-products more fully. Increasing volume of business is also a factor in this.

4. Temporarily, at least, high transportation and merchandising costs.

There can be no question that certain types of small producers, particularly farmers, sometimes concentrate their attention so much on

one product—cotton, for example, in the South—that they neglect opportunities to be more self-sufficient to advantage, both in the matter of supplies for the farm business itself, and in the matter of supplies for the family consumption. It may be actually cheaper in some cases for farmers to buy certain supplies than to produce them—apples, for example, on many farms. But unless the farmers grow them, they will not have them. The effect, therefore, of not producing these products for themselves is that they deny themselves things that they would rather have than those they buy with the money they obtain from selling cash crops.

In general, however, the tendency in the world is more toward specialization than toward diversification. Even on farms, there is a growing tendency toward specialization, not so much in terms of one product as in terms of two or three as contrasted with the near self-sufficiency of more primitive conditions. This tendency is ordinarily expressed by saying that agriculture is becoming more and more "commercialized"—that is, our farms are producing more and more "for the market," are selling more and buying more than formerly. Even the fathers of our present generation of farmers can look back to the time when "ready money" was very scarce on the farm because the farmers had little to sell.

Few of the influences tending toward diversification count at all heavily in determining what an individual will do with his effort. Robinson Crusoe was shoemaker, tailor and boat builder, as well as hunter, farmer, housekeeper and cook. But even the most self-sufficient of modern producing units, the farm family unit, does not require the farmer to be a carpenter, a mechanic, a veterinarian, a lawyer, a physician, or a preacher—although betimes he may have to be a little bit of almost any of these; nor does it require that the housekeeper shall be a paper hanger, a decorator, a seamstress, a nurse, a musician or a school teacher—although some of them at times perform many of these functions. The farmer is almost in a position to be merely and only a farmer, and the housekeeper to be merely and only a housekeeper. The self-sufficiency of the farm family unit is mostly in the matter of producing food, fuel, and still to some extent, clothing, for the use of the family.

Even where diversification is apparently gaining ground, it is only a limited amount of diversification. While it is true that some highly specialized lines of production are tending to take on supplementary and complementary products and by-products, it is equally true

that enterprises which are carrying too many lines are dropping some of them. The tendency is therefore toward a middle ground.

In this conflict of tendencies, changing economic conditions play an important part. A rise in freight rates increases diversification by encouraging complementary enterprises, while an improvement in the technique of production gives an advantage to specialization. During the war, the federal government urged our people to be as self-sufficient as possible, so as to reduce the burden of our railroads. Since the war, the traffic burden has been increasing rapidly again in spite of high freight rates. Nevertheless, many producers are more self-sufficient than they were. Farmers, for example, are growing a larger proportion of their hay, potatoes, and other bulky commodities.

VIII. COMBINATION OF ENTERPRISES CONSIDERED BY COMMUNITIES

When a community or city is taken as the unit, there is comparative advantage for a much larger assortment of products than when an individual farm or factory is taken as a unit. Following are some of the reasons why this is true:

1. Many products need to be consumed near the place where they are produced because they are perishable or are too bulky to be hauled long distances economically. In this class are milk and cream, eggs, locally grown fruits and vegetables, hay, wood for fuel, sand and gravel for building, etc.

2. Most services must be produced in the home community—for example, such services as medical service, legal service, teaching service, merchandising, sewing and tailoring service, etc. To be sure, members of the community desiring such service may travel to other cities for them, but such travel is costly, and moreover, it is highly important at times that it be within quick easy reach. At present the tendency in this respect is to depend upon the outside for more and more of such services, especially the higher grades of such services.

3. The community as a whole has a very varied population, and it takes a good many types of industries to provide employment for all of them. Small cities with only one or two small factories in them frequently provide poor employment for some classes of their citizens. Certain types of industries, often called "parasitic," tend to be established in such cities so as to utilize these classes of labor. Among these are canning factories, knitting factories, and candy factories.

4. Some industries are seasonal, and hence there is need for other

industries to supplement them by employing the labor at other seasons of the year.

5. Farm products are produced in the areas around most villages and cities, and since these villages and cities are the local assembling points for these products, they tend also to be the points for processing them. There are two reasons for this, one, that the products are usually transported more cheaply after they are processed, and the other, that some of them have to to be processed for local consumption anyway.

The same description applies to other than farm products—to such products as lumber and ores—but to a lesser extent.

6. Some products needed for local consumption are more advantageously manufactured at times by importing the raw materials and manufacturing them at home. Bakery products and ice cream are examples of this. The gas and coke combination is a still better example.

There is a conflict always going on in most communities between some of the local enterprises and competing outside enterprises; for example, between the local bakeries and the outside bakeries; between the local laundries and outside laundries; between the local stores and the mail-order houses; between the local nurseries and outside nurseries. The local consumers buy from the outside whenever they think that they can buy from them more cheaply, or that they can buy a better quality of goods, or that they get better service. Sentimental arguments in favor of supporting home industries are freely advanced; but they have little weight.

The larger the area which is included in one economic group, the more of its requirements it is likely to meet at home. This is because there will be more commodities produced somewhere within the region which can be exchanged within the region. There may be a source of fuel supply somewhere within the region; or a good orchard district; or a water-power situation furnishing the basis for a manufacturing district. There will also be larger cities in it which provide the high-class educational or medical or legal services which the small cities cannot afford. The large cities may also provide a financial and banking service much needed by the smaller communities within it. They may also serve as wholesaling and jobbing centers, providing a merchandising service for the retailers in the smaller communities. Thus a whole region like the so-called "Northwest" may come to center more or less around a metropolitan center like Minneapolis-

St. Paul and become a sort of economic unit. Other such economic units are the regions including cities like New York, St. Louis, Cleveland or Chicago.

The region to be considered as a unit will very often be a nation. Some nations are so small as hardly to be much more than good-sized communities. Others are more like the regions mentioned in the last paragraph and include many communities. Others, like the United States, or Russia, or Brazil, are large enough to comprise several large regions. In any case, there is a distinct tendency for nations to have a more varied industry than similar units not inclosed within national boundary lines. This problem will be taken up in a later section.

SUGGESTIONS FOR FURTHER STUDY

The problem of combination of enterprises has not been discussed by economists a great deal. The agricultural economists have discussed it more than anybody else. See Chapters IV and XXXII of H. C. Taylor's *Outlines of Agricultural Economics* (1925), and Chapters VII and IX of L. C. Gray's *Introduction to Agricultural Economics* (1924), for a discussion of the agricultural phases of the problem.

Some of the principles which are involved are analyzed in J. M. Clark's *Economics of Overhead Costs* (1923), Chapters III, IV, V, VII. See particularly those sections of these chapters which treat of joint products and joint costs.

PROBLEMS

1. Write a definition of each of the following: by-products, joint products, supplementary products and complementary products.
2. a. Are all by-products joint products?
   b. Are all joint products by-products? Explain.
3. Why are there more supplementary relationships in agriculture than in manufacturing?
4. Why are there specialty stores in the cities, but not in the smaller towns?
5. Distinguish between a side line and a supplementary enterprise.
6. Publicity agencies have been trying for several years to persuade farmers to quit specializing in one crop and diversify (produce several products). Is this contrary to the principle of specialization?
7. Do drug stores operate contrary to the principle of specialization when they serve lunches and sell jewelry, groceries, etc.? Explain.
8. Take several (at least three) producing units and show for each one:
   a. What requisites it has for specialization by tasks.
   b. What limits its amount of specialization by tasks.
9. Under what conditions might it be advisable to manufacture a by-product even though it did not sell for enough to pay costs of manufacturing?

10. A laundry firm in a small city just outside of Madison, Wisconsin, was approached by a university student with a proposal as follows: "You have your biggest run of work in the first half of the week. I will agree to ship you five hampers of laundry each Wednesday so that you will have something to keep your plant busy during the second half of the week. What discount can you give me from your regular listed rates?" Show in detail how you would figure upon such a proposal.
11. The proprietor of a certain small country store decided to quit selling feed as a side line because he could not make his usual 15 per cent margin upon it. Was this good reasoning? Explain.
12. Which of the following are by-products? Supplementary products? Neither? Give reasons:
    a. Ice cream made and sold by a creamery.
    b. Veal calves produced by a dairy farmer.
    c. Clothes pressing done by a tailor shop.
    d. Luncheon room maintained by a department store.
    e. Handling of eggs by a country merchant.
    f. Selling of flour, feed and fuel by a country lumber yard.
13. What would be a proper way of figuring upon the question of whether to hire a taxicab when needed or operate an automobile of your own?
14. A certain large factory has two boilers for heating its building by steam. During a large part of the year, both are idle, but during extra cold weather both are used. At present, the factory buys its electrical power, but it is debating the question of producing its own by installing a steam engine and a dynamo. What are the questions involved?
15. Since the last depression in agriculture, there has been a falling off of the enrollment of students at the University specializing in agricultural education. Has comparative advantage anything to do with this?
16. There are hundreds of different products manufactured in Minneapolis. Does this disprove the statement that an area tends to specialize?
17. The comparative advantage of a business unit practically always works out as dollars and cents; but not always so in case of the individual. In what other ways may an individual measure his advantage?
18. What kind of an enterprise is a cigar counter in a restaurant? Why is it there?
19. Many schools have vocational directors and many factories personnel managers. What is their function?
20. The United States raises special types of horses and cattle for different purposes. The Swiss raise practically only one breed of cattle, which they work, milk, and eat. Does this mean that Switzerland is producing contrary to the principle of specialization?
21. Practically every city has one or more organizations that boost the city as a place for starting business. If such organizations are to send out true information and not simply propaganda, what kind of studies must they make?
22. Would it be possible to find a person working at two kinds of work every day, one in which he had an advantage, and the other in which he was at a disadvantage.

23. List three complementary enterprises carried on by the University. Explain why they are complementary.
24. A railroad owns and operates large tourist hotels at points along its line. Are these complementary or supplementary enterprises? Give your reasons.
25. A telephone company finds that it can send telephone and telegraph messages over the same wires without interference. Is the telegraph service a supplementary enterprise? A joint product?
26. Are "self-sufficiency" and "complementary" synonymous terms?
27. Write a report for your street car company upon the advisability of establishing motor bus lines parallel to the principal street car lines. Develop your report according to the principles given in this chapter.

CHAPTER IX

THE CHOICE AND LOCATION OF ENTERPRISES

In the four preceding chapters, our objective has been to account for specialization by areas and persons, and to explain the way in which it takes place. In this chapter the point of view will be that of the individual area choosing its own line of specialization; and in the chapter following, that of the individual person choosing his own line of specialization. The principles involved in approaching the subject from the two points of view are absolutely the same, and have already been presented. All there is left to do is to apply them to a series of special situations.

In this chapter three situations will be considered: first, that of an individual producing unit, either already started or about to start, choosing what enterprises and products, if any, it will combine; second, that of an entrepreneur choosing a location at which to start a new producing unit; and third, that of a city choosing what industries to establish. Other situations might be considered, but these three are enough to show the nature of the problems and the method of analysis.

I. WHAT ENTERPRISES TO COMBINE AND IN WHAT PROPORTIONS

This situation is taken up first because its analysis grows so directly out of the principles outlined in the last chapter. The enterprises whose combination we are to consider stand in joint-product, supplementary and complementary relationship to each other.

The question as to whether or not to combine two or more enterprises, and the further question as to the proportions in which they should be combined, are of such nature that one cannot readily be answered without the other. Consequently they will be taken up together.

Two methods of analysis have commonly been followed in answering these two questions: the method of substitution, and the cost accounting method. The first method consists of estimating in advance the effect on the total net income of the business of substituting possible

new combinations of enterprises for the present combination. The basis of the cost accounting method is an historical study of the cost of production of each of the products in the combination. On the basis of this information, an estimate is made of future costs of production of each of the products, and these costs are compared with the estimated selling prices. The final result is an estimate of the *relative profitableness* of the different products. The method chosen for principal presentation here is the method of substitution, both because it follows logically from the principles already presented, and because it is more simple, direct and practicable for most combinations of enterprises.

Supplementary Combinations.—The following are a number of illustrations showing the method of substitution used in analyzing supplementary combinations. The first assumes a shoe factory manufacturing a full line of moderate-priced men's and boys' shoes, which is now considering the advisability of adding a line of men's cheaper heavy work shoes. Shoe sales in the regular lines are still somewhat seasonal, and are very much subject to rapidly changing styles. Work shoes change their style very slowly. It is therefore much safer to keep work shoes in stock than the regular lines. This means that a factory can safely run on work shoes during slack periods of the year. The same workers will therefore do most of the work, but probably at lower piece-rates; or perhaps the level of piece-rates for the whole factory will be lowered gradually because employment is more steady. Some additional equipment will be needed. The work shoes will probably have their soles sewed with McKay stitchers instead of Goodyear welting machines. Additional lasts will be needed. Additional space will be needed for the new equipment, for storing the additional store of materials and lasts, and for storing the finished work shoes. Probably a great deal of additional space will be needed for the latter purpose. Perhaps an additional foreman will be needed to help with the management. The same salesmen will sell the shoes. Since they are paid in part at least on a commission basis, the selling costs will increase somewhat. There will be a tendency, however, for the commission rates to be lowered as the sales per man increase. The traveling expenses of the salesmen, a very important item, will be increased little if any.

On this basis the business of the company before and after one year of operation with the work shoes as a side line might appear as follows:

1924 without the side line:		
Total receipts	$1,050,000	
Total expenses	1,000,000	
Balance		$ 50,000
1925 with the side line:		
Receipts from regular line	1,030,000	
Receipts from sales of work shoes	228,000	
Total Receipts		$1,258,000
Additional expenses:		
Labor	$ 75,000	
Materials and supplies	120,000	
Rent	3 000	
Royalties on machines	2,000	
Management	2,000	
Miscellaneous	1,000	
	$ 203,000	
Total Expenses		$1,203,000
Balance		$ 55,000

The special operations on the new basis have added $5000 to the net income. Expenses have been increased $203,000 and receipts $208,000. The receipts from the regular line have been reduced $20,000 because the salesmen neglected it a little for the new line. The owners of the business will now have to decide whether or not the extra $5000 is worth the extra trouble it is causing them. The chances are that they will say that the side line will not require so much supervision next year, and that the salesmen will handle it to better advantage, and that presently we can reduce our piece-rates and commission rates a little, or at least we will not have to raise them as soon as will some of our competitors without the side line. The $5000 is therefore only a beginning.

There are many things that might have happened in a case of this kind to make the balance sheet come out the other way. For example, the salesmen might not have pushed the new line hard enough to make it worth while, or the management might have given so much time to the new line that sales fell off badly in the regular line. In such a case, the decision of the owner would be more likely to be in favor of dropping the new line; but not necessarily so—they might very wisely in many cases decide to give it another year's chance.

If the line of work shoes ultimately proves to have been a mistake and is dropped, the experiment will have been a costly one. Con-

sequently whenever a new enterprise is taken on, the management will want to do the very best that it can to estimate the outcome in advance. Obviously the method that it should use is to make up a statement like the above, using estimates of additional receipts and expenses based upon the best information obtainable. Any data that the management has as to the past operations in its own plant will be useful. Estimates will have to be obtained from somewhere as to the labor cost of the work shoes. The piece-rate schedule can probably be figured out pretty definitely in advance. Prices of raw material and supplies have to be estimated in any case, for the regular line the same as for the work shoes. In general, however, the prices of shoes and the prices of leather keep fairly well together. Additional royalties and rents can be estimated with accuracy. If the management makes a mistake in its estimates the first year, it can improve upon them for the second year, and presently come to know pretty closely what the line of work shoes is adding to the net income.

Now let us apply the method to an agricultural case—let us say a farm of 320 acres in the Red River Valley of Minnesota, which is now being used mostly for growing wheat. Enough oats and hay are grown to feed the horses, and also hay and a small amount of corn for a small herd of dual-purpose cattle. The peak loads of work for man and horse come at wheat planting time in the spring and at wheat harvesting and threshing time in the late summer. Much special day labor is hired for this latter period. The proposal is to substitute 25 acres of potatoes for 25 acres of the wheat. The potato planting comes after the wheat planting; the cultivating and spraying comes mostly before the wheat harvesting, and the potato harvesting comes after the threshing in the fall. The same horses will do all the additional work. The only additional horse-labor expense will be for the extra feed required because the horses will be working more of the time—the working ration of a horse is nearly twice the maintenance ration. So far as the man-labor is concerned, about the only extra expense will be for special labor to assist in picking up the potatoes. The regular help on the farm—the farmer himself and his boys—will do all or most of the planting, cultivating and spraying, and a good deal of the digging and picking. There will be some saving in the amount of labor hired for wheat harvest because of the decreased acreage. The only extra equipment expense will be for a planter, a sprayer and a digger. There will be two considerable items of additional expense, seed and spray materials. It is assumed that rents will be the same

in the two cases. As a matter of fact, they should be less for the potato crop because wheat land needs badly to have tilled crops grown upon it in rotation. When a crop like wheat is grown upon the same land year after year, the land becomes badly infested with very troublesome weeds and plant diseases, and the plant foods in the soil get out of balance from continuous drawing upon the same ones all of the time. It should be possible to estimate most of the additional expenses mentioned in the foregoing with a fair degree of accuracy. Wage-rates and prices of seed and sprays will of course have to be forecasted. Estimating the effect on receipts will require forecasting the yields and prices of both wheat and potatoes. The safest assumption as to yields is the average yield on similar land in the community for as many years as possible, with corrections for any assured recent trends. About the same procedure will have to be followed for prices. The forecast of receipts made on this basis may be widely off the next year, especially with a crop like potatoes whose prices vary greatly with the yields; but over a period of ten years they will not be far from correct.

This case better than the other one brings out the shortcomings and advantages of such a method of analysis. The potatoes grown on 25 acres will probably sell year-in and year-out for over $1000 more than the wheat from the same land. The out-of-pocket expense for labor on the potatoes, seed and spray, plus the value of the extra horse feed and of the use of the extra equipment, due account being taken of any savings in any of these because of the somewhat reduced acreage of wheat, will not amount to over $400 at the most. The $600 additional income is the return to the members of the farm family for working hard many days when they might have been idle, and to the farmer himself for assuming additional management responsibility. Is it an adequate return? No one can answer that question but the farmer himself and his family. It is adequate if they "think" that it is, or even if they go ahead and do it without thinking, as they are sometimes said to do. There is ordinarily no way in which the farmer himself, or an outsider, can place a value upon labor so used, and deduct this "value" from the $600 and say that the balance is "profit." At least, there is no way that anyone with a sense for economic values or scientific method can use. Moreover, for the purpose in hand, the farmer does not need such a value—all he needs to do is to decide whether the extra effort he and his family are putting forth seem to be sufficiently recompensed by the $600.

If the question were as to the proportion between the enterprises

above discussed, between the regular line of shoes and the work shoes, between the potato and the wheat enterprises, the method of analysis would simply be an expansion of the foregoing. The effect on expenses, receipts, and net incomes of a larger line or smaller line of work shoes, of 10, 20, 30, 50 or more acres of potatoes, would be estimated. The larger the supplementary enterprise, the greater the conflict with the other enterprise is likely to be. If this method of analysis were applied to the examples discussed in the last chapter, it would be said that the laundry enterprise could be expanded to the point where it began to reduce the income from the barber business more than it added in other net income. It might accomplish this by turning away barber patrons, or by making it necessary to hire extra help. The expanding peanut oil enterprise could reduce total income only by crowding the cottonseed oil enterprise and at the same time operating upon a lower margin. The elevator side-line business could expand too much only by interfering with the grain handling during the busy season, or by overworking the manager, or by entailing more special expense for extra building space and the like than the income from it warranted.

Farm organizations, however, offer the most interesting examples of the balance of supplementary enterprises. If a corn enterprise is overexpanded, it is necessary to keep extra teams which are needed just for the corn alone, and by the corn enterprise only at the spring planting. If fewer horses were used, the end of the planting season would be delayed too much, and the yield would suffer. Expanding the corn enterprise will also probably mean hiring more labor for the crop season or for the first half of it, than would otherwise be necessary. Perhaps the conflict in the use of land is even more serious than in the use of labor. The extra corn will have to be substituted for some of the oats or hay in the crop rotation. This will mean that the plant foods needed by corn will be used up more rapidly and the land will wear out sooner unless fertilized more heavily. On the other hand, if the corn enterprise is too small, there will not be enough work to keep horses and men busy during the planting, cultivating and harvesting period, especially during the cultivating period. Furthermore, the soil will not be kept in as good tilth because not cultivated enough.

We are now in a position where we can bring to a head all that has been developed with respect to supplementary enterprises in the form of the following definite statements of procedure:

1. *Take on a side-line or supplementary enterprise whenever the total income from the whole business (including such tangible values as good-*

will as well as money income) is increased thereby enough to make the extra entrepreneurial effort involved worth while. This means that the supplementary enterprise must add more to income than it does to expenses: that the income from the supplementary enterprise must exceed the expenses especially due to it by an amount that more than equals any reduction in the net income of the other enterprises.

2. As a corollary to the foregoing, *reduce the size of the main enterprise and expand the supplementary enterprises whenever the total net income is increased thereby*, and likewise *expand the main enterprise and reduce the supplementary enterprises whenever this will increase the total net income, differences in the entrepreneurial effort involved always being given due consideration.*

3. *When no one enterprise can be considered as a main enterprise, the organization consisting of enterprises which are mutually supplementary, keep the proportions of these enterprises such that they conflict as little as possible and if conflicts must occur, choose the enterprises that add most to the total net income.*

4. *In deciding whether or not to organize a new producing unit, consider the net income from all possible combinations of supplementary enterprises.* The supplementary or side-line enterprises together may warrant starting a new unit when one enterprise alone would not.

By-Product Combinations.—The usual type of joint-product combination that appears for analysis is one involving a main product and a by-product. Consequently the discussion here is all in terms of such a situation. The additional expenses of by-product enterprises are generally easier to separate out than those of supplementary enterprises. When this can be done, the by-product enterprise can be analyzed by itself, its expenses being balanced against its receipts. But as already pointed out, by-product enterprises are frequently supplementary in their use of labor, plant and equipment. In such cases, the additional expenses of the whole business must be balanced against the additional receipts.

As with supplementary combinations, not only the price of the by-product, but the cost-rates of the elements of production determine whether or not it will pay to manufacture the by-product. With wages at a high level, it may not pay to manufacture the by-product. Of some by-products, the supply is always so small relative to the demand that all available quantities are sure to be converted. This is probably true of soap and cleaning compounds. Of others, the potential supply

is so great that only so much is manufactured as will sell for a price that pays the extra costs due to it. Cottage cheese is a good example of this. Almost any creamery in the country could easily produce more of this product than it could sell at a price that would pay the extra costs of its manufacture.

Some by-products have competing uses. For example, skim milk may be sold at a small figure for live stock feed. Straw is worth something as feed or bedding for live stock. Coal tar is worth something as fuel in other parts of the plant. In such cases, the by-products must not only pay the extra costs of manufacturing, but also what these are worth in the competing uses. To illustrate in the case of cottage cheese, if the skim milk can be sold for 20 cents a hundredweight as stock feed, and it costs 10 cents per hundredweight to manufacture it into cottage cheese, it must sell for at least 30 cents per hundredweight or it will pay to sell it as stock feed.

If, however, the waste product has no other use whatever, then it is worth making into a by-product as long as it sells for anything at all over the additional expenses involved, plus whatever the entrepreneurs consider is necessary to recompense them for their extra trouble. If we go one step further, we come to the waste products which must be disposed of at an expense. In this case, all that the by-product enterprise need do is to reduce this expense.

The proportion between the by-product and the main enterprise is in large measure determined in advance by the volume of by-product material arising from the production process. At least, this is the upper limit of its size. It may be smaller than this if the market will not take the full output at prices that will pay the additional expenses involved. In general the larger the by-product enterprise, the less the costs per unit of output, because space, equipment and management are more fully utilized. It will occasionally happen, however, that a full expansion of the by-product enterprise may produce conflicts in the use of these production elements when a part expansion of it would not. In such circumstances, only part of the by-product material may be utilized. As in the case of the supplementary relationship, the by-product relationship can be summarized briefly in the form of a few rules of procedure as follows:

1. *An otherwise waste product should be converted into a by-product whenever the by-product will sell for more than the expense of such conversion, due consideration being given to additional entrepreneurial effort involved. If the waste product has a disposal expense, the by-product*

may sell for less than its conversion expense so long as it reduces the disposal expense. Since most by-products enterprises are somewhat supplementary, it is a safer procedure, however, to apply Rule 1 under Supplementary Combinations above and balance total expenses of the business against total receipts.

2. *As a corollary to the foregoing, keep the size of the by-product enterprise such that its products will sell for the greatest surplus over the additional costs, due consideration being given to its supplementary aspects, and to the entrepreneurial effort involved.*

3. *In deciding whether or not to organize a producing unit, consider the possible net income from by-products as well as from main and supplementary products.* The by-products may warrant starting new unit when the main product would not alone.

Complementary Combinations.—There are two conditions under which complementary enterprises should be established. The first is when the commodities or services needed can be produced more cheaply in this way than they can be bought. The other is when only by producing these commodities or services for itself will a family have them. In many people's eyes, "time is cheaper than money." When they produce for their own use, they have a chance to balance directly the urgency of their want for the product against the effort of sacrifice involved in producing it. The chances are that they will make a fairly rational choice under such circumstances. When it is money, however, which they must spend for the things they would like, their balancing of effort against desires is likely to be erratic and ill-considered. Some will weigh the dollar more lightly than the effort which it represents; more will err in the other direction. All such will produce for themselves things for which they will not spend the money. An additional reason for this in many cases is that the necessary time and effort can readily be spared.

The proportion between complementary enterprises is determined in large part by the amount of the product of each that can be used to advantage by the other. The size of the power plant is adjusted to the power needs of the manufacturing enterprise. The volume of acid produced will probably be approximately what is needed in the rest of the plant; although there will be cases when it will pay to produce more and develop a market for it. The amount of live stock kept will be enough to consume the feeds that can be grown on the farm; or in some cases, the amount of feed grown will be adjusted to a given

amount of live stock. The more live stock kept, the more fertilizer available for the crops. The fertility of the soil may therefore become a determining factor; if the farm is in a run-down condition, the operator may keep additional live stock and buy extra feed.

In view of the fact that nearly all complementary enterprises are supplementary in the use of some of the elements of production, the only safe method of analysis is to balance the expense and receipts of the whole business with and without the complementary enterprise, and with various proportions of the complementary enterprise. In no other way, for example, could a farmer tell whether it was paying him to grow his own oats, or whether to keep six or eight horses. In agriculture, many of the effects of changes of this kind take a long time to show themselves. Thus if farmers in the corn belt were to stop growing oats, the full effect of the change on the soil would not appear for some time.

The rules for complementary combinations are so much like those for supplementary combinations that it does not seem necessary to state them.

The Cost Accounting Method.—In the Cost Accounting Method of attack on the problem of what enterprises to combine, the effort is to determine the "relative profitableness" of the different products by determining their costs of production and comparing these with their selling prices. The costs actually striven for are of the product already produced. The costs are therefore historical costs. Before they can be used in estimating the relative profitableness of future production, they must be adjusted to a future basis by applying forecasted cost-rates for labor, supplies, etc., to them. Similarly future prices for the several products must be forecasted.

The procedure according to the method of relative profitableness may be illustrated by the following; Suppose a certain factory were canning the following three products, peas, beans and sweet corn, and that the costs of production per can last year obtained by the cost accounting method, and the selling prices per can last year, were as follows:

	Peas	*Beans*	*Sweet Corn*
Costs of production—per can	.084	.078	.069
Selling prices—per can	.102	.100	.083
Profits—per can	.018	.022	.016

It would appear from the figures then that the bean enterprise had been the most profitable of the three, and the corn enterprise the least profitable. Let us assume that a similar analysis for the preceding year also showed beans the most profitable of the three and corn the least profitable. The problem is to determine in advance which will be the most profitable next year—and the years following. Canning factories make contracts with the growers in advance of the planting season. The prices specified in these contracts are probably the largest single factor in determining the cost of the product. Other important costs are labor, power, cans, salt and sugar. The prices of all these will have to be forecasted for the coming year. So far as the selling prices are concerned, the only basis the factory will have for forecasting is the probable acreage and any recent tendencies in demand for the three products. All these forecasts being made, the results are combined into a statement of relative profits per can similar to the foregoing, and this is used as a basis for expanding or contracting each of the three enterprises. If it appears that the bean enterprise will pay the largest profit again next year, the assumption is that this enterprise should be expanded.

Cost data have many important uses in production economics. Many such uses are outlined in later chapters in this textbook, particularly in Chapters XI and XII. The method of substitution outlined above requires considerable cost data. In particular, it is not possible to forecast additional expenses with any degree of accuracy unless records have been kept of quantities of materials and supplies used, of labor and power required for various operations. In the case of farm production, records must also be kept of the dates when the various operations on the farm are performed and of the conflicts that arise between different enterprises from year to year. Data also need to be kept of yields, production and prices. But the using of cost data in figuring *relative costs of production* by the cost accounting method, these costs of production to be used as a basis for determining the relative profitableness of the different products in the manner outlined above for peas, beans and sweet corn, has proved in most cases to be a largely futile undertaking. The results obtained have generally been so misleading that they have either been cast aside, or in actual use have been so largely qualified by common sense consideration that they have lost nearly all semblance of their original form.

In order to see the reasons for this, let us examine a few typical

cases. The reasons are particularly evident in the case of combinations of supplementary enterprises. Take, for example, the case of the shoe factory and its supplementary line of work shoes: the traveling expenses of the salesmen carrying the two lines are greater than they would be when carrying one line, probably only by the amount of the cost of transportation of the extra baggage of shoe samples. Shall only this be charged as cost of selling the work shoes? If so, then the cost of selling the regular line will be higher because the salesman will not sell as many of the regular line as he would if he were concentrating upon it alone. The true cost of selling the work shoes is therefore something more than the extra baggage cost. But how much more? This is extremely difficult if not impossible to determine with any degree of accuracy.

The same difficulty will arise with respect to manufacturing labor. Much of this is done on a piece-rate basis. One might think that under such circumstances the costs would be easy to separate, that each line of shoes could pay for its own piecework, and that would be all there was to it. But unfortunately the piece-rates tend to be different with side line enterprises than without them. As a result of providing steady work throughout the year, the company presently finds that it gets help more easily than before, and so lowers the piece-rates. It does not do this all at once, of course—this would cause too much criticism. In a period of rising wages such as from 1895 to the present, perhaps all that it does is not to raise its piece-rates along with its competitors who do not carry the side lines. Now to charge the same piece-rates to the side line as to the main enterprise under such circumstances would surely be unfair to the side line enterprises. In other factories a lower set of piece-rates may be established for much of the side line work. The workers prefer laboring at these low rates to earning nothing. If this system is followed, the wages actually paid for work on the work shoes may fairly closely approximate true costs. However, one can never be sure on the one hand that the efficiency of the work on the regular line is not interfered with by the side line, or, on the other hand, that the piece-rates on the side-line work are as low as they really should be—the tendency will be to lower the rates on the regular line somewhat as well as make lower rates on the side line.

The same situation prevails in the case of the labor hired by the day and paid the same rates at all seasons, and in the case of workers paid on a regular salary basis. Some of the work on the side line is

done by the old office force, and some of it by additional help hired. The same analysis applies to the hired management. The same managerial staff may do all or most of the additional planning and supervision; but if so, it will not give as much attention to the regular line. As for equipment costs, the depreciation from use on machines owned by the factory and used for both lines would be more rapid; but it is difficult to determine how much. If the extra space needed for the side line is already available in the building, there may be no extra rent charge; but still there may be some loss in efficiency from crowding.

Now if the cost of producing and selling work shoes is to be determined and compared with their selling prices so as to determine whether the work shoes are paying better or not so well as the regular line, all these various elements of costs—sales labor, manufacturing labor, office labor, hired management, equipment, building space—must have a value placed upon their use in both the work shoes and the regular line of shoes. It should be apparent that this cannot really be done.

What those who try to use the cost accounting method for the purpose actually do is to place arbitrary values on all the cost elements. For example, they divide selling expenses in proportion to the volume of sales of each line of shoes, use the same piece-rates for all shoes alike, divide rent according to floor space and volume of shoes, and hired management cost according to labor cost or labor time, etc. Using these arbitrary values, they actually produce cost figures. But the figures cannot safely be used after they are obtained. As one would expect, they nearly always show supplementary enterprises either carried on at a loss, or at relatively low profits. They frequently show them carried on at a loss even though in fact they have increased the net income of the business. The effect on net income must be the final index of success of an enterprise, and any system of analysis that gives results which fail to check with this standard is no safe guide to follow.

In joint-product combinations, the further complication enters of dividing the cost of the raw material between the different joint products. For example, how can one divide the price paid for a carcass of beef among the different cuts? How much of the price paid for wheat is to be charged to flour? How much to bran? How much to middlings?

In complementary combinations, what value will be placed on the

product of one enterprise which is used by another? Shall corn fed to hogs be charged to the hog enterprise at what it would sell for at the farm? Or at what it cost to produce it on the farm, assuming this could be determined?

The second of the difficulties with the cost accounting method of attack on this problem is that many of the elements of production can have no values placed upon them. This difficulty arises especially in the case of small producing units like farms, small retail stores and small shops, where a large part of the work is done by the proprietor himself and members of his family. Family labor usually has no market away from the store or shop or farm; or if it has, the family does not care to take advantage of it. Hence its values must be determined at home if at all; and this cannot be done. The method of valuing such labor at what it would cost to hire a substitute is absolutely contrary to economic principles.

A third limitation of the cost accounting method for the purpose in hand is that even in its ideal form it could only tell us the relative profitableness of a given combination or proportion of enterprises. We could not know from the results of such a study whether it would pay to expand or contract a supplementary enterprise. In fact, the very reason that a supplementary enterprise may pay so poorly is that it is not expanded enough. If this were true, the proper procedure would not be to abandon the enterprise, but rather to expand it. But how could one know this from data on relative costs and profits last year from a particular combination? Only after a period of years and trying out many combinations could one arrive at a conclusion as to the scale on which given supplementary enterprises should be conducted, and only then would one know how profitable it really was.

We can now return to our canning factory illustration and discuss it more intelligently. Let us assume that the three lines, peas, beans and sweet corn, are supplementary in that they are ready for canning at different times, and that taken all together they provide a nearly continuous use of the plant from about June 15 to September 15. To drop any one line of them would raise the cost of the others because it would mean a more incomplete utilization of the plant. The bean harvest, let us say, crowds closely upon the heels of the pea harvest, and some years conflicts seriously with it during a week or ten days. The sweet corn never conflicts with the beans—in fact, the factory is usually idle for a week or two during August. There surely would be no purpose under these circumstances of contracting the sweet

corn enterprise. Perhaps the change most needed is an expansion of the sweet corn enterprise so as to run the plant more nearly to capacity in September, and thus reduce costs. Reducing the contract price for beans might induce some growers to shift from beans to sweet corn. As between the beans and peas, it would appear, from the figures given, that the peas ought to give way to the beans if either is to be expanded; but one could not be sure of this until a careful analysis had been made of the detailed operation of the period when the conflict occurred. It might easily be that year-in and year-out the peas canned during the particular period of the conflict add more to the net income than the extra beans that might be taken on in their stead. Now it is obvious that in a situation like this no scheme of charging the cost of labor, management, plant equipment and power at the same cost-rates to all three products is going to tell the truth as to which product is adding the most to the net product and which if any ought to be expanded. Nor is it likely that any scheme devised for charging these elements of production at different rates to the different enterprises will give results that check very closely with the final test of effect on the net income.

In no field of production is the Cost Accounting Method of determining relative profitableness of enterprises so nearly useless as in agriculture. In no other field of production are there as many joint-product, supplementary and complementary relationships; and in no field of production are proprietor and family labor so large a part of the total. Samples of different problems that arise in applying this method to farming are the following: (1) Dividing the cost of hired labor employed by the month for the year or season between the crops and live stock enterprises, and between the different crop and live stock enterprises. Chore labor on the live stock is done night and morning, and in the winter months when for the most part no field work is available. Some crops require care mostly at slack periods; others mostly at rush periods; others at a mixture of slack and rush periods. (2) Determining the cost of horse-labor in the first place, and then dividing it between enterprises in the second place. The division is fully as difficult as in the case of man-labor. (3) Placing a value upon manure produced by the live stock enterprises and used by the crop enterprises. (4) Dividing rent between the different crops grown in a rotation. The crops make different demands upon the soil for plant food, and some of them fill in more or less vacant places in the crop rotation. Some of them are necessary to keep the soil in good

tilth and keep the weeds down. The method of valuation actually employed in such cases are roughly the same as those indicated for the shoe factory problem. The results obtained are of the same general nature, only less satisfactory. Enterprises which are highly supplementary in their use of labor, like dairying, or in the use of land, like oats, appear to be carried on at a loss in altogether too many cases.

The final statement to be made with respect to the use of the cost accounting method for the purpose in question is that it is not necessary to go through the great labor involved in it. The method of substitution generally answers the questions for which an answer is sought as nearly as they can be answered in view of the uncertainties of the future, does it with much less effort, and by an approach which is direct and easily understandable. Furthermore, it calls for no violation of economic principles or departure from the methods of science. The two methods use much of the same production data at the beginning; and both require forecasting at the end. The principal difference is that the cost accounting method requires a laborious attempt in between at dividing costs between enterprises, and for this purpose the making of a large number of doubtful assumptions.

It is significant in this connection that the cost accounting method was developed by engineers and not by economists. Engineers, as already pointed out, have in large part been the managers of our industrial enterprises. Confronted by the very real problem of determining whether a given enterprise was making money for the company, they developed a method of solving it which, as one would expect in view of their training and experience, was largely mechanical. They tried to carve into geometrical segments a living organism, a going business; and found that it would not work very well after they put the parts together again. Meanwhile the economists were busy speculating over value and price; and the problem of the engineer entrepreneurs went without a real solution.

The reader must not be left with the impression that cost analysis has no value. The point here made is only that "*the cost accounting method" is usually not a satisfactory method for determining what enterprises should be combined, and in what proportions*, which is the problem here being considered. The method of substitution itself needs cost data—such data as quantities of materials and supplies used and their prices; hours of man-labor, horse-labor, and machine-labor used; time of the year when farm operations are performed; yields and production; selling prices. Such data need not only to be collected,

but also analyzed. Also as will appear later, production economics presents many problems for analysis besides those of combination of enterprises; and for solving many of these, the data of costs are highly useful.

II. WHERE TO LOCATE AN ENTERPRISE

The case taken for analysis in this section of the chapter is that of a person or company of persons who already have pretty well in mind that product or combination of products which they intend to produce, who are seeking for the best place to locate their business. Location for an enterprise always has to be considered in general and in particular. For example, one seeking a location for a furniture factory needs to decide not only in what section of the country to locate it and in what particular city, but also in what part of the city. There is also a choice most of the time between buying out a business already established and starting a new one. It will not be possible here to analyze the problems of location in detail. All that is intended is to point out the factors to be considered and show the method of analysis. An analysis of this kind has three phases as follows:

A. The business itself—its needs.

B. The prospective location—the extent to which it meets the needs of the business in question.

C. The supply and demand aspects—the supply of other potential competing areas in proportion to the probable demand for the product of these areas.

Let us follow through these three phases the analysis of the location of a farming business, a manufacturing business, and a retail business.

A Farming Business.—A farming business is taken for analysis just because it illustrates more completely than the others the three phases of the problem. Our case is that of a farmer seeking for a place to establish a small fruit farm. He proposes to grow strawberries, red and black raspberries, currants, gooseberries and blackberries. The general farming operations carried on the side will be oats, corn and hay to provide feed for the two horses needed for the farm work and for a few cows and chickens. Small fruit must be grown more or less in rotation with field crops, and it is desirable to keep cows and chickens enough to consume the field crops on the farm.

A. *Analysis of the needs of the business.* It is assumed that any person contemplating the starting of a small fruit farm is already

fairly well acquainted with the business. Either from experience or from reading, and in most cases from both, he must come to have the following information about each of the kinds of small fruit which he is considering growing:

1. Climate: frost hazards, winter-kill hazards, summer drouth hazards. In northern latitudes the strawberry crop is occasionally an almost total loss because of late frosts that come at blossoming time. Drouths in late July and August frequently destroy the blackberry crop in regions too far north or west. Some varieties of small fruit stand drouth, or cold winters, or late frosts better than others.

2. Soil: Certain kinds of soil are not well suited to any small fruit; and some are better suited than others to particular kinds of small fruit, even to particular varieties.

3. Disease and pest hazards of each species of small fruit.

4. Topography: Direction of slopes and air drainage are important at times.

5. Quantities and types of fertilizers and mulches needed.

6. Probable yields and volume of crop to be marketed.

7. Distance that these crops can be hauled to market advantageously.

8. Labor input of the various operations needed in caring for and harvesting each of the crops.

9. Capital requirement for growing the crop.

B. *Analysis of the area.* For the next step in the analysis, the prospective small fruit farmer will want to obtain the following information about each of the areas which he is considering. Not all areas considered, however, will need to be analyzed this closely—some can be discarded very early in the analysis.

1. Climate: Average dates of last killing frost, number of years in which killing frosts came after blossoming time for various varieties of strawberries, extremes of winter temperatures, occurrence of summer rainfall and drouth, etc.

2. Soil types and possibilities in a great deal of detail for each particular tract of land considered.

3. Diseases and pests rampant in the district.

4. Topography of each tract of land.

5. Sources of supply of fertilizer and mulches, and comparative costs by areas.

6. Labor supply available for care of crop, and particularly for picking the fruit. Rates of pay.

7. Prevailing yields in the community, if they are available from the experience of others.

8. The potential outlets for the crop—the number of potential buyers, the type of market in which sold, etc. Prices prevailing in the market.

9. Type of road available for hauling.

10. Land values and rents.

11. Interest rates on short-time loans and perhaps on mortgages. Banking facilities.

12. Living conditions, educational facilities, etc.

The foregoing combines considerations pertaining to whole market areas and those pertaining to particular tracts of land in any one of these areas. The choice may be only of the latter sort.

C. *Supply and demand conditions.* As a final step in the analysis, a study should be made of competition in the various market areas under consideration. This involves not only the number of producers at present and their volume of production, but the probabilities of increase in their production. A market area in which there is an abundance of suitable land which has few alternative uses is far from being as good a place to make a start as one with a limited area of really satisfactory soil and much demand for it from competing crops. It will frequently be found that there is one producer of strawberries in an area who surpasses all his competitors in the quality of his crop, or in the earliness of it, merely because of a highly desirable piece of land.

When the three foregoing steps in the analysis are completed, it is frequently a good plan to combine the results into a sort of an operating statement for such area. This should include detailed estimates of prospective receipts and expenditures and net income from each tract of land being considered. The farm organization in each case should be adjusted to the particular tract of land so far as this can be done without disrupting the original plans too seriously. The principal purpose of preparing such statements is to insure that all the factors in the problem have been duly considered for each case.

A Manufacturing Business.—The analysis required before starting a new manufacturing business is like the foregoing, except that very little attention is ordinarily given to climate, soil and topography, and very much to cost, sources of supply and transportation cost for raw materials and supplies; to sources of supply and costs of power; and to labor and capital supply and wages and interest rates.

There are important differences between cities in all these respects. Smaller cities have lower wages and living costs, but it may prove difficult to attract an adequate supply of skilled workmen to them. Factories starting in a new line of manufacturing in a city may be handicapped severely by a lack of skilled operatives. It takes a generation or two in some industries to develop a local supply of really skilled workers. If the industry in question is one whose need for labor is seasonal, one must consider very carefully how its employment period will dovetail with those of other industries. A city which has considerable unemployment at the right time is the most favorable of all locations, from a labor supply point of view. One should also consider in this connection the probable future specialization in manufacturing in the city in question. If it gives promise of being a great steel manufacturing center, the level of wages will be set largely by this industry and the labor supply will run largely to the grade and type used in this industry.

In general, the large cities have the better transportation facilities and more favorable freight rates. Manufacturing in a small town in many cases means shipping raw material and supplies out from a large city center near by and then shipping a good part of the finished product back to or through the same city center.

Of more importance is it to locate in a section of the country that has cheap transportation connections with the major raw materials and supplies, especially if these are of the bulky type. One would not want to locate a factory for making flax-fiber insulating material in the East; or a furniture factory for making oak furniture at Omaha or Kansas City.

Transportation costs of raw materials, however, cannot be considered separately from transportation costs for the finished product. If one is about as bulky as the other, it makes little difference whether the factory is located near to the sources of supply of raw materials or to the consumers. The freight rates are usually higher on manufactured products than upon the raw materials. If, however, the consumers are scattered more or less in all directions around a manufacturing point, whereas the raw materials come from one point only, more attention must be given to the transportation costs of the latter. One of the important conditions favoring location in a large city is that a large group of users of the product are immediately at hand.

In many cases, the most important of all analysis to make is that of market outlets. If the product cannot be sold, it will not be manufac-

tured very long. In general it can be said that no factory should ever be started in any area unless a sufficient outlet is practically assured in advance, or some selling plan is projected which seems very certain of success. Many a factory his failed because its selling plan took too long to get results. In analyzing market outlets, a careful study must be made of competition at all competing points in the same general market area. Transportation costs from the plant in question and from all competing plants to the various consuming points within the area should be carefully determined to see which consuming points can be considered as reasonably within the territory of the plant in question. The farther that a company pushes its sales campaign into territory reasonably belonging to a competitor, the stronger resistance its salesmen will meet and the higher the costs of selling. If the enterprise is one like a local creamery or a meat-packing plant whose problem is more largely that of procuring a supply of raw materials from a surrounding area than of disposing of the product, the method of analysis is practically the same except reversed. Potential competition should be considered along with that already at hand. Is this a location in which your product or some other is likely to have comparative advantage? At what points will the new factories be established?

In the old days when cities were smaller, factories were usually located down town near the freight stations and switch yards, and also not far from banks and other places of business. In a small city, such a location is still possible and very desirable. But in our modern large industrial cities, the factories are increasingly locating out on the edge of the towns, or even in suburbs, usually adjacent to car tracks entering the city. This gives them as good if not better transportation connections, cheaper sites, and better living conditions and lower rents for the workingmen. In a very short time after such a new industrial district is established, neighborhood retail stores put in their appearance, and the doctor and the dentist hang out their shingles; and presently the street car company thinks it worth while to build an extension. Modern city planning and zoning is helping a great deal in establishing these industrial districts. The factories are segregated in one area, and the factory workers' homes in another area not far away.

A Retail Store.—In locating a retail store, one should know in advance the probable expenses of running such a store, and the volume of business and turnover of goods necessary to keep the costs per dollar of

sales within a reasonable figure. The other most important analysis is of sales territory and competition. In analyzing the sales territory, it is worth while to make a general survey of it, getting such information as the number of competing stores, the sections in which each of these does most of its selling, and its probable volume of business. The incomes and consuming and buying habits of the residents in the area should also be studied closely. It must be remembered that a new retail store starting in an area takes all of its business from stores already in existence. Yet it is almost always possible at least to get one started. If the new store is located in the same block as the old one, it gets business because some people are always more or less displeased with the old merchant, or are always glad to try something new. If it locates at a point in between stores already established, it gets considerable business merely because of its convenience. But although the new store may get started, it may never get enough business to pay expenses.

In many ways, therefore, it is better to buy out a store already established than to try to start a new one. But one must make sure that the old one is well located. It probably would not be for sale if it were prospering. All that needs to be done to safeguard one from making such a mistake is to make a careful study of the business being considered for purchase. It will be well in most cases actually to prepare a map showing the location of the regular customers.

The choice between location at a street corner, close to it, or in the middle of a block, is often an important one. The better location may be vital to the success of the business, and hence the higher rent must be paid if the business is to start at all. The extra rents can be reduced to the basis of per-dollar-of-sales and compared with the saving in per-unit expenses from the estimated larger volume of sales. The method commonly advised for comparing the value of a location for some types of store is to count the number of people who walk by them in a week. But the method is scarcely adapted to stores selling largely over the telephone.

The foregoing may be considered an unreasonable amount of figuring in advance of starting a simple retail establishment. The answer is that if such figuring were commonly done, we would not have as at present a majority of our retail stores selling out or closing out within the first few years.

III. WHAT INDUSTRIES TO BRING TO A CITY

The problem of location of enterprises often nowadays takes the form of a city determining what industries should be encouraged to establish themselves there. There scarcely can be found a city of a few thousand inhabitants in the United States but has a "Chamber of Commerce" which makes boosting for new industries its most ostensible function. The principles involved and methods of analysis are necessarily the same as in the preceding case. Only the point of view is different. In place of waiting for some enterprise to come along looking for a place where much labor is unemployed during the winter months, the city makes a survey of its labor situation, of the amount and types of employment and unemployment by months, and then goes out looking for industries that will fill the gaps. In place of waiting for some outsiders to discover that some commodity imported into the area could be manufactured more cheaply at home, the city determines this to the best of its ability for itself and then goes about getting some one to start a factory.

It must be said of much work of this kind that it is not very intelligently done. The tendency is to try to secure almost any kind of a new industry; and the result is that many of them started with great acclaim presently languish and die out. In its right mind, no city would want to acquire an enterprise that stood a good chance of failing. But an ambitious commercial secretary, judged as he is largely by the number of new enterprises he secures, rather than by the success of those already established, may go to almost any extremes. The commercial secretaries in the larger cities, however, have already changed their methods considerably. They are basing their expansion programs more and more upon careful preliminary surveys of the same general sort that a prospective manufacturer would make for himself.

Some Chambers of Commerce have adopted the alternative plan of encouraging expansion only in industries that have already demonstrated their suitability in the location. But even this must be carefully done. Competition may already be too keen. In a certain Middle Western city recently, the commercial club helped get a new hotel started. The first year's business has been decidedly unprofitable and what is worse, some other hotels have had to pass their dividends because of loss of custom. Excess capacity is already altogether too prevalent in many lines in many cities.

SUGGESTIONS FOR FURTHER READINGS

Reading materials dealing with choice of enterprises and methods of analysis as a basis for such choices are very meager. The agricultural economists have given most of the attention to it. The reader is referred to H. C. Taylor's *Outlines of Agricultural Economics* (1925), Chapter IV, and to Part III of University of Minnesota Agricultural Experiment Station Bulletin 205 (1923), *A Study of Farm Organization in Southwestern Minnesota*, by George A. Pond and Jesse W. Tapp, for discussion of the practical application of the Method of Substitution in the determining of the choice of farm enterprises. L. C. Gray's *Introduction to Agricultural Economics* (1924), Chapter IX also deals with the selection of enterprises for the farm.

For discussion of the choice of a farm, see G. F. Warren's *Farm Management* (1913), Chapters 18 and 19, R. L. Adams' *Farm Management* (1921), Chapter 4, and T. F. Hunt's *How to Choose a Farm*, 1906.

The location of industrial enterprises is discussed in John C. Duncan's *The Principles of Industrial Management* (1911), Chapters II, III and IV; Edward D. Jones' *The Administration of Industrial Enterprises* (1922), Chapter III; and H. Diemer's *Factory Organization and Administration* (1910), Chapter I.

The location of industries within a city, and the problems connected therewith, are discussed by Frank L. McVey in *The Making of a Town* (1913), Chapter VI. E. H. Bennett considers the same question in his article Planning for Distribution of Industry in *The Annals of the American Academy of Political and Social Science* Vol. LI, p. 216. Chapter III of Edward M. Bassett's *Zoning*, National Municipal League (1922), Technical Pamphlet Series, Number 5, also discusses important phases of the subject.

PROBLEMS

1. What is the difference in immediate objectives between the Substitution and Cost Accounting methods of analysis?
2. Summary statement of a hardware jobbing house before and after the addition of a line of sporting goods:

1925—Without the additional line—			
Total receipts	$850,000.00		
Total expenses	807,500.00		
Balance—Net Profit			$42,500.00
1926—With the additional line—			
Receipts from regular line	$830,000.00		
Receipts from sporting goods	70,000.00		
Total receipts		$900,000.00	
Additional expenses:			
Cost of goods	$ 47,500.00		
Advertising	500.00		
Sales expense	700.00		
Management	300.00		
Miscellaneous	700.00		
Total additional expenses	49,700.00		
Regular expenses	807,500.00		
Total expenses		$857,200.00	
Balance—Net Profit			$42,800.00

Upon what considerations would you base a report advising the continuance of the sporting goods line?

3. Select a business with which you are familiar and consider the advisability of adding a side-line enterprise. Use the methods of Substitution, assume figures and present an analysis similar to that given in the text. State your conclusions and give the reasons therefor.
4. In Problem 2, so far as can be determined from the data given, to what extent do the two enterprises conflict?
5. The owners of a baseball park in a large city are asked to consider the following propositions:
   a. To lease the park from October 15 to December 15 for professional football contests;
   b. To lease the park on certain nights between May 15 and October 1 for boxing matches;
   c. To lease the park for semiprofessional baseball games when the home team is playing elsewhere.

   The park owners are to furnish ground keepers, ticket sellers and takers, ushers, programs, tickets, etc., for all the above occasions.

   Upon what basis will the owners decide to accept or reject any of the above offers? State your conclusions and the principles upon which they are based.

6. A manufacturing plant has a waste product which it is disposing of without cost, but which could be made into a marketable product for which there is a good demand. Set up a hypothetical case, assume expense and receipt data and show how the company would arrive at a decision as to whether it should produce the by-product.
7. A chemical plant has been convicted of pollution of the river upon which it is located, and ordered to dispose of its waste in a harmless manner. It will cost the company $20,000 per year to maintain a satisfactory waste disposal plant. At the expense of $35,000 per year, it can process the waste material so that it will sell for $20,000. Which method of disposal should the company adopt? Why?
8. A paper mill has been buying its pulp. It has the opportunity of buying a large tract of pulp timber and manufacturing its own pulp. Under what conditions should it take on this complementary enterprise? Assume expense and receipt figures illustrating the method of analysis which should be applied.
9. What are the limitations of the Cost Accounting method of analysis?
10. Can costs of production of true joint products be determined? Explain.
11. What factors will be given the most consideration in the location of the following businesses:
    a. A watch factory.
    b. A mail order house.
    c. An agricultural implement factory.
    d. A coal mine.
    e. A sugar refinery.
    f. A private school.
    g. A fountain pen factory.
    h. A shipyard.
    i. An exclusive millinery shop.

CHAPTER X

THE OCCUPATION OR TASK FOR THE INDIVIDUAL

The problem of analysis in this chapter is that of finding for the individual the line of work in which he has comparative advantage. Three typical situations will be taken up for special analysis: 1, an individual choosing a vocation for himself; 2, an employer choosing employees; and 3, an employer fitting men already on his payroll to occupations and tasks. In each case, the analysis must cover three phases: 1, the individual; 2, the job; and 3, the supply and demand aspects. It will be observed that these exactly parallel the three phases of the problem of choosing a location for an enterprise.

I. AN INDIVIDUAL CHOOSING A VOCATION

This is a subject which had much vogue not long since under the name of "vocational guidance," and to which interest is again returning rapidly because of the popular slant which psychology has recently acquired. It is here proposed merely to relate it to the principles of economics involved and to map out the general method of analysis. The subject is surely of great importance both from the individual and from the social point of view. In the end, no matter where they start, a majority of overambitious persons gravitate to the level of occupation for which their qualifications really fit them, and similarly most persons with superior ability rise by self-advancement and promotion to the level of occupation for which they are qualified. But there are many misfits upon the various levels—some are lawyers who should be engineers, some teaching literature who should be teaching language or history, some farmers who should be small contractors, some retail merchants who should be traveling salesmen. Also a great deal of energy is wasted by individuals while they are finding their proper levels. It would mean a great deal to our nation if only the right boys and girls, and all the right boys and girls, entered high school or college or took up professional or graduate study. There are many who should pass from the grades directly into vocational courses or apprentice training. This includes some who are now

trying to handle a high school curriculum. On the other hand, there are many who go to work at this stage who would more surely, and certainly more quickly, find their proper level if they were to take a high school course first. The same mistakes occur at the end of the high school training period.

The Analysis of the Individual.—The information which an individual really needs about himself is data concerning his productivity at various lines of work. The only way for him really to obtain such data is to put himself to the test of actual performance at the various occupations. But this is clearly impracticable for those lines of work requiring a long period of training and preliminary experience, and wasteful even for the simplest sorts of tasks. We are therefore forced to fall back upon methods of analysis of an individual which will enable him to forecast his productivity at different kinds of work. This is primarily a task for a psychologist. It calls for physical and mental measurements. The physical measurements can be made with reasonable accuracy. It is not difficult to measure strength, endurance, sight and hearing. Automaticity and quickness of perception and even ability to memorize are also rather definitely measurable. But beyond this point, mental measurement walks upon rather weak crutches as yet. Mental tests may be either of a specific type, designed to test for fitness for particular jobs, or of the general intelligence type. The former are much more worth while. A rating based upon an average of many fitnesses is not of great value in determining suitability for a particular kind of work. For example, one would not want to choose between research and salesmanship as a life work on the basis of a general intelligence test. Furthermore, the various mental tests stress the different capacities differently. Most of them stress mental alertness more than anything else, neglecting such important qualities as power of concentration, persistence, resourcefulness, imagination and initiative.

Even though the psychologists might be competent to test mental fitness correctly, this would be far from proving that individuals could do it for themselves. On the whole, we are probably not very good judges of our own special abilities. Most of us must try our hands at many things before we appreciate that there are some which we do indifferently well. Others underrate their capacities for important kinds of work. One of the important gains from attending college is that it enables a person to match his abilities against those of his fellows and evaluate himself and discover his special aptitudes and

limitations. Certain courses, such as mathematics, are especially valuable for such purposes. But after all, college experience tests only for what has been aptly called "college ability," which may be quite different from administrative ability, research ability or sales ability. In due time, the psychologists will feel more competent than at present to analyze individual capacities, and will undertake to perform this service for their fellow men. There are many fakirs who call themselves psychologists who will perform such a service now. Professor D. G. Patterson of the University of Minnesota recently told a business men's club that they and their fellow business men of Minneapolis had probably spent $150,000 for fake psychology in the preceding twelve months.

The problem of the analysis of the individual will be discussed further in Chapter XIII under the head of *capacity* and *efficiency*.

The Analysis of the Job.—Most of us have ideas as to the type of person who is needed to succeed at our line of work, and usually at such other lines besides as medicine, law, engineering, business or politics. But do we really know? A western university recently decided that it would help its entering students choose the right college by supplying them with information as to the qualifications necessary for success in the various fields. To obtain this information, it sent out a questionnaire to men working in all the important fields. The replies obtained indicated that a high degree of almost every kind of ability was needed for success in all of the fields. Other inquiries have met with a similar fate. One fault with them is that the groups chosen have been too large. A surgeon needs very different abilities from a family physician; a criminal lawyer from a probate lawyer. Another fault is that the inquiries have not provided for differences in degree of importance of the various abilities for different kinds of work. If a hundred surgeons were asked to rank a dozen different abilities in the order of their importance for their work, their answers would not disagree violently.

Another method of attack on the problem is to go out and measure the men who have been successful and those who have not been successful in the various lines of work. In a study of this kind made a few years ago, sixty employers were asked to name their three best and three poorest men for a given type of work, and then to rank each of them as to about twenty characteristics, such as technical information, speaking ability, ability to plan, etc. Defective as such a method must be, because based only upon superficial appearances, it neverthe-

less gave surprising unanimity of answers. If psychologists were to do the measuring, and had their science developed to the point where they were willing to use it in such a way, this method of attack would no doubt yield important results.

Another method of attack is to analyze in detail the operations involved in particular lines of work. Submitted to careful analysis, the job of feeding a certain machine may be proved to require a considerable degree of manual dexterity, and power to keep attention focused, but little muscular strength or even endurance; the job of obtaining the data for a certain set of records may require a high degree of accuracy or faithfulness in observation, but scarcely any degree of memory or imagination or understanding whatever. The technique that has been developed for study of the motions involved in performing certain operations, and for measuring the muscular strength required by them, has made this method of attack upon job analysis very successful in most types of factory operations.

The Supply and Demand Aspects.—If the two types of analysis above outlined were adequately developed, an individual choosing a vocation would be able to say: these are the degrees to which I possess certain characteristics; these are the degrees of characteristics required for various degrees of success in these various occupations. But still he would not be ready to choose his vocation. He would want to know in addition as to the probable future demands for workers in these various occupations, the numbers now engaged in them, and especially the numbers preparing or getting ready for them. If it is worth while for the Unites States government to collect data of this sort with respect to horses and mules and apples and apple trees, it would surely seem worth while to do likewise for humans and human occupations. The census of occupations taken every ten years helps somewhat with the problem. It at least furnishes a rough basis for determining long-time trends. What is needed is first a more adequate and more carefully analyzed decennial census, and then machinery for collecting data of changes in the various occupations, and in numbers preparing for them, at yearly intervals between. The census of manufacturing now taken every five years could well be expanded to include a thorough occupational analysis. Most of the important trades and professions have their associations, and these could well do much more work than at present along the foregoing lines. A particular service which such associations will always need to render is to disseminate the data collected by official agencies. Their avenues for

reaching the people in their fields are sure to be better than those the federal government will have.

Armed with such information, the individual will frequently find that the occupation for which his characteristics seem to make him best suited does not offer a promising future because it is already over-stocked and shows little sign of expanding, or because many are now preparing for it. Under such circumstances, he may still want to take up this line of work if *his efficiency for this kind of work is markedly higher than for any other work he might do*—he may be able under such circumstances to rise toward the top in spite of the competition. But even though he promises to be far more efficient at this line of work than at any other, there may be so many persons clearly his superior in this field that they will surely acquire all the really worth-while positions. If under such circumstances, there is some other line of work in which he promises to be fairly efficient, and in which the competition is likely to be less severe, he will do well to think kindly of it. The world is full of people who are little good for much of anything except types of work at which one has to have exceptional ability in order to stand out at all. Literally thousands upon thousands of people are always spending their lives nursing to little effect a very small talent in music and painting and literature. Meanwhile plumbing, carpentering and interior decorating are being neglected.

The foregoing is of course merely stating over again that part of the principle of comparative advantage which says that efficiencies must be compared not only as between occupations for any one person, but also as between different persons for different occupations.

Whatever the achievements of psychologists in analyzing men, and of engineers in analyzing jobs, and of statisticians in collecting and analyzing data as to occupations, it will never be possible to reduce the task of choosing a vocation to exact-science accuracy. There will always be qualities of individuals making for success or failure which defy measurement. Human nature in the individual case is not very certain—it offers many surprises. Trends in industry and needs in the various occupations will never be predictable with a high degree of certainty. The invention of a machine may cause one industry to expand and another to decay. Hundreds of railroad construction engineers had to seek other occupations when railroad building came nearly to a halt fifteen years ago. Nevertheless it seems certain that in the aggregate and over a period of time a much better job of choosing vocations can be done than at present.

As an illustration of how the present system works, may be mentioned the experience of our universities. Around 1900 there was a great surging of our young people into the field of engineering. First it was civil engineering, then electrical engineering, then mining engineering, then chemical engineering. Forestry had a burst of popularity about 1905, which presently died out, probably because it was premature, and which is now reviving again. The agricultural colleges had their boom period from 1910 to 1915. After the World War, the commerce schools shot to the front, and the enrollment in the agricultural colleges shrank to a low figure. This surging of students into one college and then another has very little reason in it. One factor in it is the degree of prosperity in the various fields for which the colleges are training men. If many iron and copper mines are inactive for a few years, then attendance falls off in the colleges of mines. The post-war agricultural depression largely accounts for the present light registration in the agricultural colleges. But these depressions are nearly all short-lived. The industries will in most cases come back stronger than ever in a few years, which means that a period of depression in an industry is the very time when young men should be preparing to enter it. This is surely true for agriculture at the present time.

Another deficit in the present system is that it seldom anticipates a new demand for trained men. If properly trained and competent statisticians were available to-day, the business world would soon absorb a great many of them.

The failure of individuals to find their right occupation is frequently pointed out by the Socialists as one of the wastes of the competitive system. Many of the Socialists believe that a state by actually directing men to different occupations could secure a better placement of them than we now have. In view of all the uncertainties in the problem involved, this seems hardly probable. For the present at least, it is surely better for the state to be content with securing the best possible information and making the widest possible distribution of it, and to let the individual make his own decision and accept the consequences of his mistakes.

The scheme of analysis which has been presented will seem very mechanical and unreal to many people. They will say that after all the important thing is getting into a line of work which one likes, that life is bigger than just production. With all these statements, the author fully agrees. Nevertheless, we must not forget that most

of us will be contented and happy in any line of work in which we are successful, and not happy and contented unless we are successful. Even if a person were to choose an occupation largely because he thought he would like it, he ought to know if possible what else he was sacrificing in so doing. Many indeed will have inherited enough of a fortune to permit them the luxury of choosing any occupation which they wish.

II. AN EMPLOYER SELECTING HIS EMPLOYEES

This is the phase of matching men and jobs which has been receiving the most attention. Large public enterprises such as school systems, state and city governments, have been forced in self-defense to adopt more or less objective methods of choosing employees. In the field of business, the urge for profits is strong enough to make men realize the importance of building up a strong personnel. Many companies spend a large sum of money each year upon selecting and training and trying out a class of young men before giving them a regular footing in their organizations. The meat-packing companies of the United States have gone so far as to establish special classes in universities where the men will get their preliminary tryout and some useful training. On the whole, more attention is generally given to selecting salesmen than any other class of workers. This is because training and trying out unsuccessful salesmen is a very costly process.

In modern large business enterprises, the task of choosing employees is frequently assigned to a *personnel department.* This is a department of a business which has for its function the handling of the human relations problems of the business, such as the hiring and firing of workmen, fitting them into the organization, studying their progress, recommending their promotions, and handling their complaints. Training in psychology is an important part of the equipment of a personnel manager.

The logical order of analysis in this second situation is first the job, and then the individual. The person doing the selecting must have a clear idea of the requirements of a job before he can expect to choose one who will fit it. The personnel department must therefore start its work by making an analysis of all the jobs in the enterprise. It is in an advantageous position for doing this, because it can study men at close hand while actually at work upon the various jobs. Its methods of analysis will be a combination of determining the characteristics of the men who are most proficient at the job, and of making a detailed analysis of the content of the job itself. The accepted pro-

cedure is to reduce all the information pertaining to each job to definite form on a "job specification" or "occupational description" card, which thereafter is drawn from the file whenever a new workman is to be selected for it. Some of the headings on such a card are the following:

Name of occupation.

Time—whether day or night work, permanent or temporary, hours of labor, overtime, etc.

Nature of work: operations to perform, machines to use; speed, accuracy and automaticity required; extent to which it is repetitive; whether done standing, sitting, walking or climbing; health and accident hazards; other disagreeable features.

Physical qualifications required: strength, endurance, height, sight, hearing, size of hands and fingers, etc.

Mental qualifications: education and experience, ability to speak and read and write English; ability to read blue prints; type of mind, etc.

Length of time required to learn the job.

Chances for promotion.

Rate and method of pay.

Other terms of employment.

The degree of detail with which such a card is worked out will depend upon how close an analysis is made of the various jobs. As the personnel department acquires experience the information on the cards will become more significant. To be thoroughly useful for such work, a personnel department must know the work of a plant in detail from A to Z.

The accepted devices for analyzing applicants for jobs are the application blank, the interview, and the examination. Application blanks are generally used as a first step in arranging employment with absent persons. For applicants who call at the office, the interview usually comes first, and the application blank is not filled out unless there is some chance that the applicant will be employed sometime in the future. Examinations are used only for work in which certain knowledge, or an ability to write well, or a considerable degree of mental ability, are necessary qualifications. Some uses are now being made of mental tests, particularly of the type which tests fitness of a particular sort. In some cases, the test comes very close to trying the worker out on the job—as one might test a trombone player for an orchestra, or a stenographer.

The objective in selection of personnel is not only to secure men who will render a high quality of service, but also men who will fit so well into the organization that they will be contented to stay. This precludes a policy of hiring men who have a higher usefulness elsewhere. The employment managers in some large cities have come to recognize the importance of this and are sending applicants to one another with a view to making best use of their capabilities. Mr. H. C. Link in his *Employment Psychology* says that the time will come when the sole aim in selection and placement work will be "to attain the viewpoint of the applicant, and to further his interests by selecting him for the work which he is best able to do, and at which he will be of greatest value to society and to himself."[1] This is merely another way of saying that employment managers will find it in the interest of their companies to recognize the operation of the principle of comparative advantage in choosing men the same as do individuals in choosing vocations for themselves.

III. FITTING EMPLOYEES TO JOBS

A personnel department not only needs to analyze jobs so as to select men suited to them, but also to analyze the men whom it finds already on the job in order to see if they are now doing the work which they can do at comparative advantage; also how well they are doing their present work, and whether they are in line for promotion. This is fully as important from the standpoint of getting the highest service out of the men and keeping them contented as is the selecting and placing of new men. The methods of analysis are the same as for selecting men, with one very important difference, namely, that an abundance of time is available to study the individual. The usual procedure for personnel managers in handling this problem is to prepare and keep a "qualification card" for each employee. This contains information as to the employee's physical, educational, and mental qualifications, as to his special aptitudes and abilities, his previous experience, and his record with the company. The latter includes periodic progress reports, results of later observations, records of sickness, accidents, promotions and transfers. If it becomes clear to a personnel manager that a certain employee has a higher usefulness in some other line of work, it is not only good social policy, but also good policy from the selfish standpoint of the company itself, for him to help such an employee find the right kind of a position elsewhere.

[1] p. 375.

SUGGESTIONS FOR FURTHER READING

Methods of selection and placement are discussed in Chapter VI of Tead and Metcalf's *Personnel Administration* (1920), and Chapters XI and XVIII of Scott and Clothier's *Personnel Management* (1923), and in Part V of the May, 1916, number of the *Annals*. Job analysis is discussed in Chapter XVIII of Tead and Metcalf and in Chapter X of Scott and Clothier. Methods of fitting men to jobs are further discussed in Chapters XII and XV of Scott and Clothier and Part V of the same number of the *Annals*.

PROBLEMS

1. A distinguished lecturer said recently that there are two classes of young people who should not go to college: Those who go because their parents did not have a college training, and those who go because their parents did have a college training. What is the meaning of this statement?
2. At present, do most people enter a vocation because of (1) Careful self-analysis? (2) Suggestions of parents and friends? (3) Study of conditions of demand and supply? (4) Chance? (5) Necessity?
3. Which of the above do you consider the most important factor in the choice of a vocation?
4. Which of the above factors is most important in recruiting people for the following occupations: (1) Medicine? (2) Law? (3) Engineering? (4) The skilled trades? (5) Farming? (6) Common labor?
5. Psychologists can now predict with a high degree of accuracy whether a student will be successful in college. If students were refused admission to college on the basis of such tests, would such action be to the advantage of the students who were not admitted to college? to society?
6. What would be the result if too many people were best fitted for some relatively unimportant task?
7. Will the improvement of vocational guidance work, personnel administration, analysis of individual capabilities, etc., tend toward more stabilized employment? Why?
8. Why is it to the advantage of the employee as well as of the employer not to place a man in a position which does not demand the best of his ability?

PART THREE

THE ELEMENTS OF PRODUCTION AND THEIR COMBINATION

CHAPTER XI

THE PRINCIPLE OF DIMINISHING PHYSICAL OUTPUTS

The science of production, as already explained, is in large part a science of combination. In certain preceding chapters, we discussed production as frequently taking the form of a combination of enterprises or products. In this and several succeeding chapters we shall consider any one enterprise as involving a combination of several elements of production. For example, a shoe factory represents a combination of land, buildings, equipment, labor, raw materials and supplies. We shall here study specifically the effect of combining such elements as these in various proportions.

We shall find in this study that these effects follow certain well-defined laws or principles, which have always been recognized, but only in a general way. It has always been recognized that an ever-increasing product cannot be obtained from one acre of land as more seed or labor or fertilizer is applied to it. If it could, food for the whole population might be grown upon a single acre. A shoe manufacturer knows that if under stress of increasing orders he works more and more men in one plant, he presently reaches a point where his output increases less rapidly than his labor. If this were not true, shoes for the whole world could be made in one plant. A cabinet-maker polishing a piece of furniture presently reaches a point where additional rubbing adds little if anything to the gloss of the finish—in fact, may even injure the finish. A cafeteria which attempts to handle increasing patronage by putting more helpers at work dishing up food will presently find that the helpers merely get into each other's way. A department store manager finds that he can increase his sales considerably by employing more saleswomen up to a certain point, but finally perhaps the increase stops altogether. Sometimes such increases in output as the foregoing are measured in physical units, such as bushels of potatoes or pairs of shoes; sometimes on a value basis, such as dollars' worth of sales, or dollars added to the selling value of the furniture. Likewise the seed or labor which is used may be measured either on a physical basis—such as bushels of

seed, hours of labor; or on a cost basis—such as dollars expended for seed or labor. But however stated, the manifestations all illustrate one common principle—a principle which for nearly a century and a quarter has been known as The Principle of Diminishing Returns.

As first stated, the principle was made to apply to a country as a whole and its food supply. Malthus, for example, in his *Law of Population* pointed out that the food supply could not be increased indefinitely with the population. Since then, the principle has come to be applied to many other circumstances and under various names. One of these names is the Law of the Proportions of the Elements of Production. Another is the Law of Resistance, meaning resistance to an indefinitely increasing product. The principle is sometimes stated in physical terms and sometimes in cost and value terms. This motley of names and terms is obviously very confusing to the beginning student in economics. This textbook will distinguish carefully between the physical and the cost and value statements of the principle. The present chapter will confine itself entirely to the physical principle, which will be designated as the Principle of Diminishing Physical Outputs. Chapter XII following will present the economic Principle of Diminishing and Increasing Economic Inputs. It is the economic principle in which we as economists are really interested; but the economic principle is based absolutely upon the physical principle, and we must therefore have a clear understanding of the physical principle first.

I. ONE FIXED AND ONE VARYING ELEMENT

Although the principle of diminishing output manifests itself everywhere about us, very few understand its operation and its implications with any degree of thoroughness and exactness. We must therefore examine its workings in considerable detail. We will start with a very simple case and then proceed to the more difficult ones. Simple cases rarely exist except in the realm of the imagination, yet simple cases must be analyzed before more involved ones can be understood.

Let the first assumed case be that of seed applied to land in the growing of a certain crop, let us say, barley. Let us assume for the sake of further simplicity that the seed bed has already been prepared, and that no labor or equipment of any kind is needed for the harvesting of the crop. Let us further assume that the area of land is a fixed amount, 1 acre, and that anywhere from 1 to 11 pecks of seed could conceivably be used upon this acre. Now obviously if only 1 peck of

seed is sown on the area, the product will be small. In the first place, the barley plants will not fully occupy the land, so that much of the land will go to waste. In the second place, certain weeds will get started which, although starting slowly, presently grow more rapidly than the barley and hence smother it. If two pecks of barley are sown, the barley will more nearly occupy the land, and will in addition keep more of the rank weeds from getting started. If three pecks are sown, the yield will be still greater; and these increases will continue until the barley crop almost completely occupies the land and few if any weeds have a chance to develop. Presently, however, the barley plants will begin taking moisture and plant food away from each other, and will begin shading each other and shutting off the sunlight. From this point on, the increase in yield will be less rapid, until it stops altogether. The additional plants will more completely exploit the plant food and moisture in the soil; but the other adverse effects will offset this, at first only a little, but finally completely. A special difficulty that arises is that the plants need more plant food and moisture at seed-forming time than earlier; hence if a large amount of seed is sown, more young plants will start than are able to mature their seed later, and the severe competition between them at seed-forming time prevents any of them from developing a full crop of seed. Hence the growth resulting will be mostly fine straw. Under these circumstances, not only will the increase in yield cease as more seed is planted, but eventually will actually be smaller than if less seed had been planted. The effect of sowing more seed upon a fixed area of land has thus been to give us first an increasing yield and then a decreasing yield. The following assumed figures may serve to illustrate these changes in a more definite way:

Inputs of seed....................	1	2	3	4	5	6	7	8	9	10	11
Outputs of grain.................	2	6	12	20	27	33	38	42	44	44	43

The term *input* is here introduced to refer to the seed. Its meaning should be sufficiently clear. It will be used in all subsequent analysis to refer to the amounts of the production elements that are used in turning out any product. The term *output* is introduced to refer to the yield or product of grain. It will be used in all subsequent analysis to refer to the amount of the product. In the present illustration, as the inputs of seed increase from 1 to 11 pecks, the outputs of grain increase from 2 to 44 bushels and then decrease to 43 bushels. If more seed were sown, the outputs would surely decrease still more.

The diagram in Figure III may help in obtaining a clearer idea of these relationships. The numbers along the horizontal line or axis at the base of the diagram represent the inputs of seed; the numbers along the vertical line or axis represent the outputs of grain. The

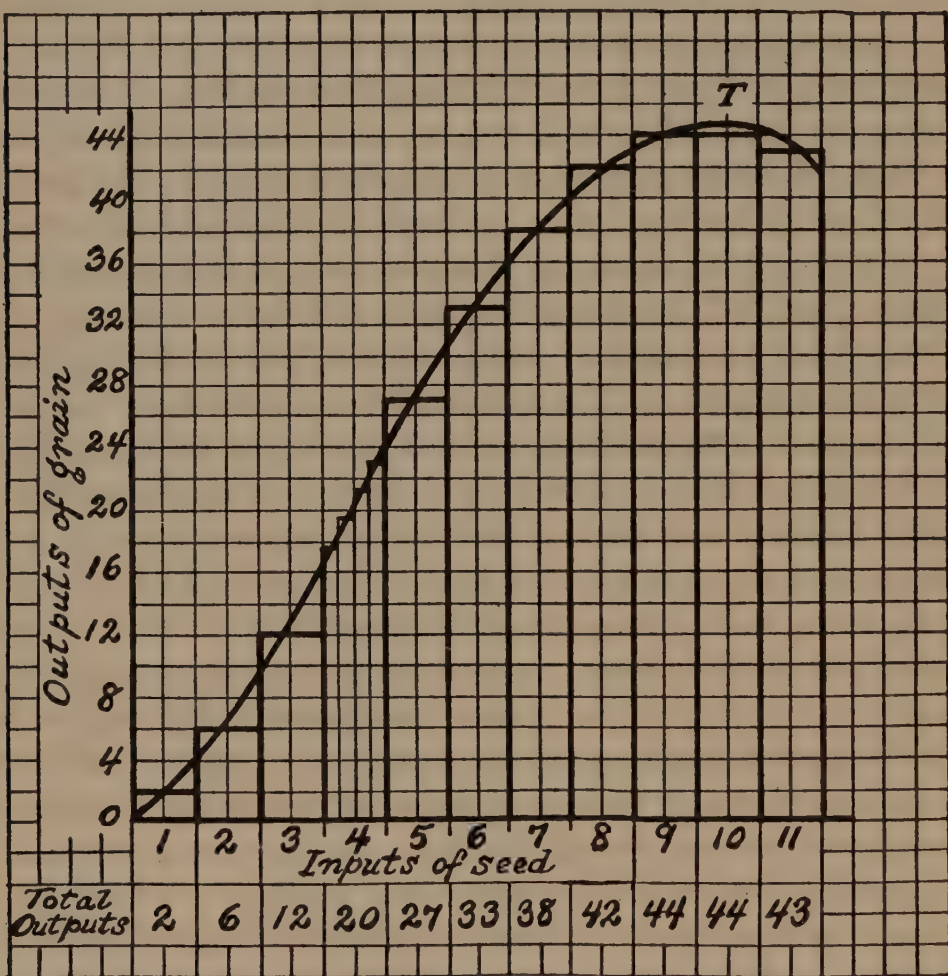


Fig. III. Total Outputs Accompanying Additional Inputs of Barley Sown upon a Fixed Area of Land.

line shows how the outputs at first rise as the inputs increase, and then fall. The shape of the curve shows exactly how much it rises or falls with each input of seed.

Perhaps it will help to understand diagrams of this sort to construct one of them. The procedure is as follows: The first operation is to choose the scale. Square-ruled or cross-section paper, as in Figure III is best to use for such diagrams. For the horizontal axis, 11 divisions are needed; for the vertical, 44 divisions. The sheet of paper in Figure III has 30 squares on one dimension, and 31 on the other. If the 30 squares are used as the base, 1 unit of input can be represented by 2 squares, and there will be 8 squares left over for space in which to

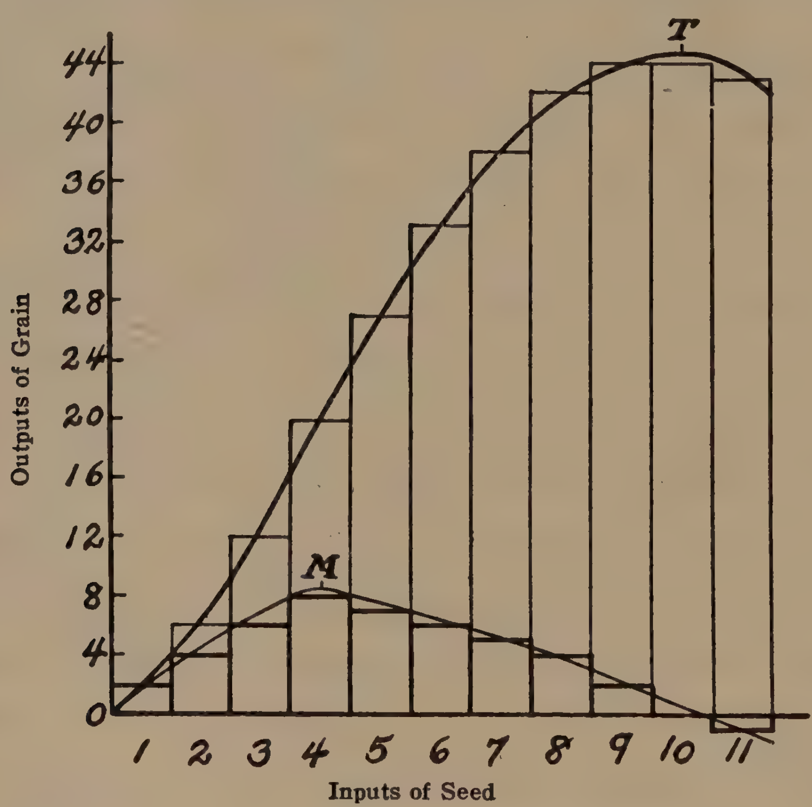
write the scale and label it. If 2 units of output can be represented by 1 square on the other dimension of the paper, there will be 9 squares left over for scale and inscriptions. Now count up, say about 4 squares from the bottom and 4 squares over from the left-hand edge, and locate the zero point, and then draw in the horizontal and vertical axes. Next mark off the scale divisions on these axes and write in the numbers of the scale, from 0 to 11 on the horizontal axis, from 0 to 44 on the vertical axis. Everything is now ready for the locating of the "points." One peck of seed produced 2 bushels of output. Therefore count over 1 scale division on the horizontal axis, and up 2 on the vertical axis. This gives the upper right-hand corner of the first rectangle. It represents graphically the volume of output resulting from one peck of seed sown on this fixed area of land. Now count over another scale division on the horizontal axis, and up 6 on the vertical axis to locate the corner of the rectangle for the second input of seed. This rectangle is three times as large as the rectangle for the first input of seed. In a similar manner, the rectangles can be drawn for the remaining nine inputs. The diagram now consists of a series of rectangles. To construct a curve, the jagged line marking the top of these rectangles must be "smoothed." This is done by drawing a curve through the midpoints or somewhere near the midpoints, of these rectangles in such a way that the area included under the curve is exactly the same as the area of all the rectangles. It will be observed in Figure III that the curve cuts off from each rectangle about as much as it adds to it, or if it does not, the difference is made up in some other rectangles. The curve which is obtained in this way is the same as would have been obtained if the seed instead of being added a peck at a time had been added, say, an ounce at a time. To illustrate this, the fourth peck of seed in Figure III is represented as divided into four parts, giving four narrow rectangles. Imagine this peck divided into a thousand parts instead of four. Any kind of a line is simply a succession of an infinite number of points.

Additional Outputs.—Now that the curve of total outputs is constructed, its behavior can be studied. The most conspicuous thing about it is that it does not rise at a uniform rate, but somewhat slowly at first, then more rapidly, then less rapidly, until it stops rising altogether at point T. The reason for this is made apparent when we compare the additional outputs accompanying the additional inputs. Thus the second peck of seed added 4 bushels to the output—the difference between 2 bushels and 6 bushels; the third peck added 6 bushels—

the difference between 6 bushels and 12 bushels, etc. Following are the additional outputs for the whole series of inputs:

Inputs of seed	1	2	3	4	5	6	7	8	9	10	11
Outputs of grain	2	6	12	20	27	33	38	42	44	44	43
Additional outputs	2	4	6	8	7	6	5	4	2	0	—1

They reach a high point of 8 at 4 pecks of input, decrease to 0 at 10 pecks, and are negative quantities beyond this point. It is while these additional outputs are increasing that the curve of total outputs is increasing so rapidly. Figure IV shows the rectangles and the smoothed curve for these additional outputs. The curve reaches the horizontal axis at the 10th input, at which the curve of total output stops rising. The point T is directly above the point where the curve of



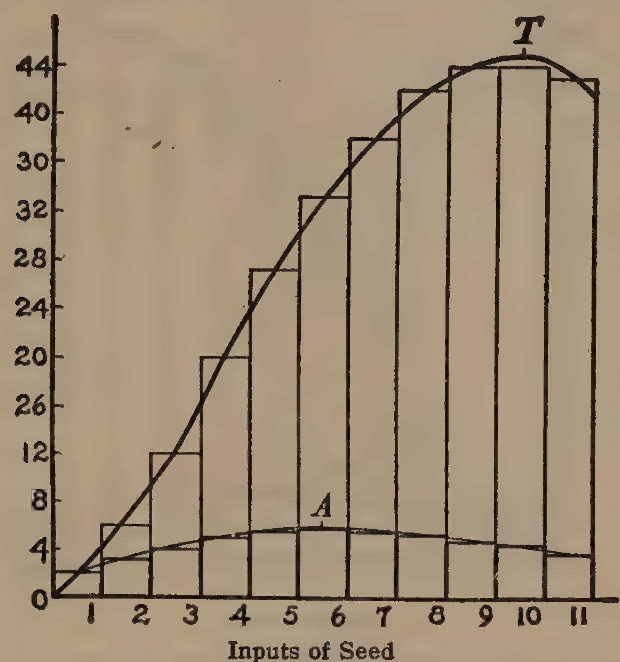
Additional Outputs	2	4	6	8	7	6	5	4	2	0	−1
Total Outputs	2	6	12	20	27	33	38	42	44	44	43

FIG. IV. Additional Outputs Accompanying Additional Inputs of Seed Applied to a Fixed Area of Land.

additional outputs reaches the base line. This curve of additional outputs will come in for a great deal of discussion in later divisions of the field of economics, particularly in Value and Distribution. It will there generally be referred to, however, as the curve of *marginal* rather than of *additional* outputs. The term marginal has come to play

a large rôle in economic analysis in the past fifty years. The last input of any element added is the *marginal input;* and the accompanying output obtained the *marginal output.* The terms additional and marginal will be used more or less interchangeably in this textbook.

The reason that the additional or marginal outputs increase to point M is, as already explained, that the weeds are checked increasingly for a time as more seed is sown. The effectiveness of the checking increases for a time because of a mathematical principle common to all crowding. Disease epidemics, for example, tend to spread in proportion to the square of the density of the population; likewise the competition between plants for sunlight. When the barley plants



Total Outputs	2	6	12	20	27	33	38	42	44	44	43
Average Outputs	2	3	4	5	5.4	5.5	5.4	5.2	4.9	4.4	3.9

FIG. V. Average Outputs Accompanying Additional Inputs of Seed Applied to a Fixed Area of Land.

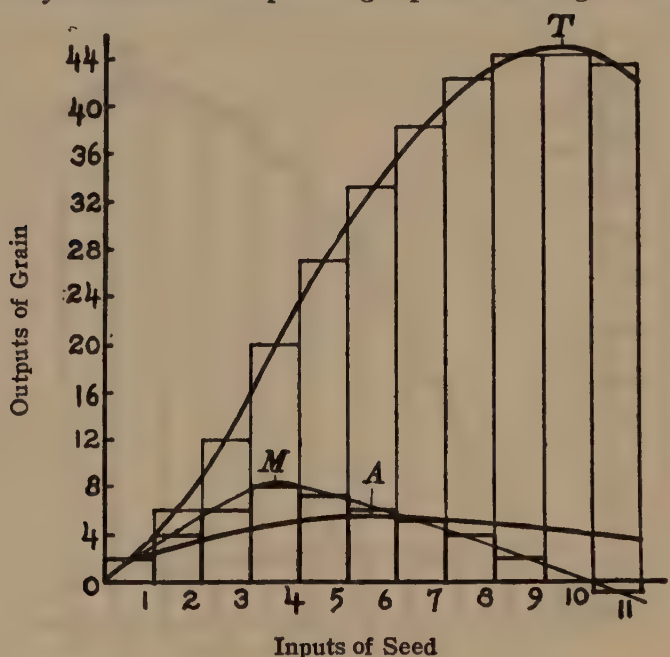
become so thick that they compete with each other more than with the weeds, then the marginal outputs decrease. If the weeds were absent, the additional outputs would be constant at first, until the barley plants began to compete with each other, and then decrease to point T.

Average Outputs.—Figure V shows still another series of rectangles and still another curve, the curve of *average outputs,* or *outputs per unit of input.* The average outputs are computed by dividing the total outputs by the corresponding inputs. Thus the average output at 2

inputs of seed is 3; at 3 inputs of seed, 4, etc. The complete series of average outputs is as follows:

Inputs of seed................	1	2	3	4	5	6	7	8	9	10	11
Total outputs of grain.........	2	6	12	20	27	33	38	42	44	44	43
Average outputs..............	2.0	3.0	4.0	5.0	5.4	5.5	5.4	5.2	4.9	4.4	3.9

It will be noted that the rectangles of average output keep on increasing beyond the fourth input; in fact, the point of diminishing average output is not reached in this case until the sixth input. The reason for this is that although the fifth and sixth inputs add less to the output than the fourth, *they nevertheless add more than did the first and second;* they therefore *help bring up the average.* After the sixth



Total Outputs...........	2	6	12	20	27	33	38	42	44	44	43
Additional Outputs.......	2	4	6	8	7	6	5	4	2	0	–1
Average Outputs.........	2.0	3.0	4.0	5.0	5.4	5.5	5.4	5.2	4.9	4.4	3.9

FIG. VI. The Foregoing Curves of Total, Additional and Average Outputs Shown in One Diagram.

input, the curve of diminishing average outputs falls much more slowly than the curve of additional outputs, for the reason that the inclusion of the third and fourth inputs *helps keep up the average;* and rarely will it reach zero. The curve of average outputs should cross the curve of additional outputs at point A. As long as any additional output is higher than the average, it will raise the curve of average outputs; and as soon as one of them is lower than the average, it will lower the curve of average outputs. The reason that they do not exactly cross in the diagram is that the inputs are added

in large units. The exact location for point A is somewhere between the 6th and 7th inputs.

Figure VI shows the three curves in their relation to each other. Given the inputs and any one of the other three curves, the other two can be computed. As the basis of all of them are the physical facts as to how the outputs actually did increase as the inputs increased. These increases can be expressed either in *total*, or *additional* or *average* outputs. The relationship between these curves, once the basic physical data are known, is purely a matter of arithmetic. These curves are known respectively as the curves of *diminishing total outputs*, *diminishing additional outputs*, and *diminishing average outputs;* and the high points on the three curves, T, M and A respectively, known as the *points* of diminishing total, additional and average outputs. These three points may be defined in general terms as follows:—

T—*represents the highest output that can be obtained from the fixed element with any input of the varying element.*

M—*represents the greatest addition to output that accompanies any additional equal input of the varying element.*

A—*represents the highest output per unit of the varying element that can be obtained with any input of it.*

General Application.—The next point to determine is how generally applicable such a set of curves is. Would they describe the effect of adding increasing amounts of labor or fertilizer to the same land or additional coal to a furnace or boiler, or additional men to a machine or factory?

So far as applications of fertilizers are concerned, it is a fact attested by common experience that the point T is easily reached. The usual statement is that too much fertilizer "burns out" the crop. What happens, of course, is that the plant food solution in the soil becomes so strong that it draws from the plants in place of the plants drawing from the soil, that is, the osmosis process becomes ex-osmosis. But how about point M? And is there a portion of the curve showing increasing additional outputs? With many fertilizers, a very small application, unless very carefully administered, is often completely lost in the soil and shows no effect on the plant. Perhaps it is lost by being carried away in solution in rain water. Where this is the case, the curve will show increasing additional outputs at first, but for a very brief period. Beyond point M, the marginal outputs will decrease very rapidly at first, then less rapidly to zero at point T. This is a fact which has been demonstrated experimentally many

times.[1] With some fertilizers, the point M probably comes at the very beginning of the curve. Results with fertilizers are greatly affected by the amount and kinds of plant food already in the soil. If a soil is already abundantly supplied with a given kind of plant food, adding fertilizers of the same kind will have no effect at all, or may even produce negative results. If the soil is particularly deficient in this plant food, the effects will be very pronounced.

The results will also be different as to whether one measures the whole plant—roots, stalks, foliage and fruit—or merely the fruit. If one could take a soil which was absolutely deficient in all plant foods and add increasing doses of a perfectly balanced plant food ration, one would find that the total plant growth up to a certain point was strictly proportional to the amount of plant food added (assuming that the plant food was all utilized, and that no plant food was obtained from the atmosphere). But if one measured fruit alone, the curve might well show increasing additional outputs for a period, especially if a large amount of seed was sown, since in the beginning very few of the plants would mature any fruit—more would start than there would be plant food enough to finish.

Applications of labor to a crop would probably give an increasing curve at the start, for the reason that the first small inputs of labor would not be enough to plant the crop properly, or to keep the weeds down, so that scarcely any plants would be able to mature. At this stage, a small additional labor input would add greatly to the product. But presently it would begin to add less, the additional harrowing of the seed bed and cultivating and hoeing being less essential than the plowing and the first cultivations. Although the point of diminishing total returns in this case would come very late, since only an extreme amount of labor could possibly do the crop any harm, the curve would become flat or nearly flat a long while before.

Let us next assume a machine which uses 8 men to best advantage. One man working alone with the machine probably would turn out no product at all; he could not feed it and receive the product at the same time. Two men might be able to turn out a little product, but they would waste most of their time running about after raw materials and the like. Three men could save some of this waste of time and effort and perhaps four men even more of it. During this stage, the curve would show increasing additional outputs. Presently, however, an extra laborer, although he could be used to advantage, would add

[1] Spillman and Lang: *The Law of Diminishing Returns.*

less to the output than the one before him, and the curve of additional outputs would start downward. It would reach the horizontal axis whenever the extra laborers began seriously to get into each other's way.

Some machines have such small capacity for labor that they are able to use only one man to advantage. Under such circumstances, the curve of additional outputs, practically speaking, declines from the start. If, however, labor in such circumstances could be added in fractions of men, the increasing portion of the curve would probably be discovered to be present in this as in the other case. It fails to appear merely because the capacity of the men for the machine, and of the machine for men, are so nearly alike.

If an increasing number of machine units were installed in a factory built for ten, the output would be strictly proportional to the number of machine units at the start, and the curve would show no increasing additional outputs. (This assumes that the few machine units each occupied the same amount of space as each of the ten, and that the rest of the floor space was left idle.) The curve of additional outputs would therefore be perfectly flat as more machines were added until it became necessary to crowd the machines more closely together. Eventually this crowding would reduce the total output of the factory.

If the fixed element were a locomotive engine and the input were coal, and the output the number of ton-miles hauled per hour, the curve of additional outputs would remain upon the horizontal axis until enough steam could be made to run the locomotive without a load, and after that the curve would rise vertically and remain nearly flat at the new level, all of the additional coal being converted into output, until a point was reached where speed became a limiting factor, or wasteful use of the coal from too rapid firing, when outputs would decrease, and finally change into losses. The curve would probably be affected at all points by the degree of efficiency with which the coal was burned at varying charges.

Suppose the problem were the number of traveling salesmen to put to work in a given territory. In some cases two salesmen will sell more than twice as much as one, which means increasing additional outputs, but probably in more cases they will not. Even though a second salesman may more than double the sales, surely a third will seldom more than treble the sales. And beyond this point M of diminishing additional outputs, the decrease will probably continue for a long time before diminishing total outputs are reached.

We can therefore conclude that the behavior of the curves of diminishing total, additional and average outputs as we described it for land and seed, is a behavior common to a large number of combinations of production elements. As a matter of fact, it could be demonstrated if time and space permitted that it is a universal phenomenon, that no combination of two elements of production can be conceived to which the principle of diminishing physical outputs does not apply. It is apparent from the foregoing illustrations, however, and it would be still more apparent if more combinations could be examined, that the shapes of the curves vary greatly with the combinations. The curve for diminishing total outputs will rise to point T and then decline in every case; but in some cases it will rise rapidly and fall away rapidly; in others, rise rapidly, remain nearly flat for a long time, and then fall away slowly; in others rise somewhat more slowly and decline either slowly or rapidly, etc. But it will be the curve of additional outputs that will show the most variation. In many cases apparently, taking units of production in such sizes as they are, the additional output curve will decline from the start; in other cases it will remain flat for a period and then decline; in other cases, remain at the base line for a while and then rise suddenly, etc. The curve of average outputs will always rise at first if the curve of additional outputs rises at first. If the curve of additional outputs declines from the start, so will the curve of average outputs. If the curve of additional outputs is flat at first, so will be the curve of average outputs. The principal difference between the two curves is that the curve of average outputs always declines more slowly than the curve of additional outputs, being kept up by the larger earlier outputs included in it.

The principle of diminishing physical outputs can be stated in terms of either of the three foregoing curves. It has been stated by economists in the past in terms of all three curves. The simplest statement is probably in terms of total outputs, as follows: *As increasing inputs of an element of production are added to a fixed element, the total outputs at first increase but presently decrease.*

Perhaps the commonest statement is in terms of average outputs, in some such form as the following: *As increasing inputs of an element of production are added to a fixed element, a point is soon reached after which the outputs per unit of the varying input element decrease.* It is advisable in this case to say nothing about the increasing part of the curve, because, as we have seen, in many cases, practically speaking

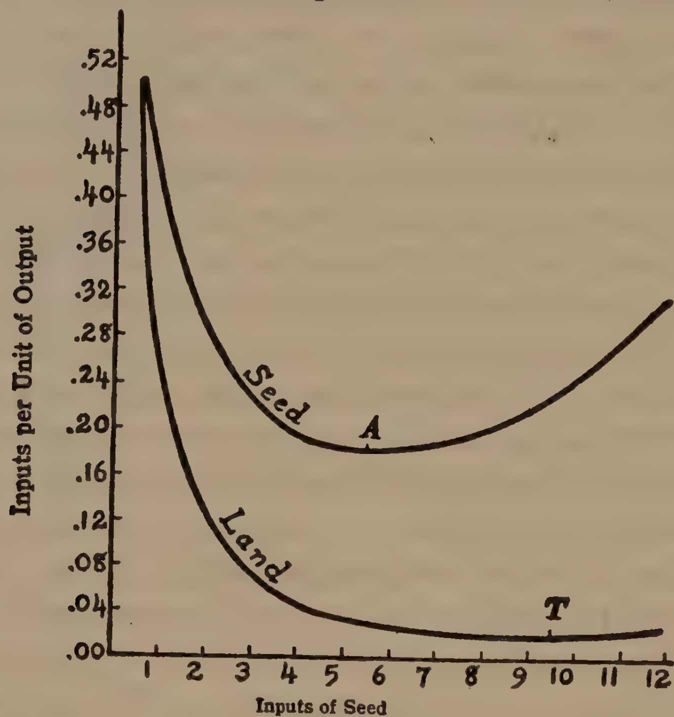
there is no increasing part of the curve of average outputs. The more usual statements of the principle in terms of average outputs speak of the outputs as *increasing less rapidly than in proportion to the inputs.* This of course amounts to the same as the above, and is not so easy to comprehend.

The comparable statement in terms of additional or marginal outputs would be as follows: *As increasing inputs of an element of production are added to a fixed element, a point is soon reached after which the additional or marginal outputs decrease, and finally become minus quantities.*

Inputs Per Unit of Output.—The curve of average outputs shows outputs per unit of input; for example, it shows the number of bushels of barley produced per peck of seed when 1 peck was sown, when 2 pecks were sown, when 3 pecks were sown, etc. Now obviously it is just as simple to express this same relationship in terms of inputs per unit of output; for example, as $\frac{1}{2}$ peck of seed per bushel of barley; $^{1}/_{6}$ peck of seed per bushel of barley, etc. Similarly 5 bushels of wheat per hour of man-labor is equivalent to one-fifth of an hour of man-labor per bushel of wheat; and 400 shoes soled per 8-hour day equals one-fiftieth of an hour per shoe; and 500 barrels of flour from a mill in a day equals one five-hundredth of a day's use of a mill per barrel of flour. As a matter of fact, we speak much more frequently in terms of input per unit of output than in terms of output per unit of input. We speak, for example, of the amount of labor and feed used in producing a hundredweight of milk, the amount of cement used per cubic foot of construction, or the amount of cloth used per suit of clothes. Any data and curves of output per unit of input are of course easily convertible into data and curves of input per unit of output. Figure VII represents Figure V converted to the input basis. The upper curve is the curve of inputs of seed per unit of output. The point A of highest output per unit of seed input becomes the point A of lowest seed input per unit of output. The curve of total outputs in Figure V becomes the lower curve in Figure VII with its low point at T. The reader may not have realized at the time it was presented that the curve of diminishing total outputs in Figures III, IV, V and VI is the curve of outputs per unit of land, but obviously this is the case. Since the amount of land is fixed at one unit throughout, the total outputs are the outputs per unit of this land; and the inputs of land per unit of barley as more seed is added are 1 divided by the output. Following are the series of inputs of seed and land per bushel of barley for Figure V expressed first as fractions and then as decimals:

Inputs of seed	1	2	3	4	5	6	7	8	9	10	11	12
Inputs of land	1	1	1	1	1	1	1	1	1	1	1	1
Outputs of grain	2	6	12	20	27	33	38	42	44	44	43	41
Inputs of seed per unit of output	$\frac{1}{2}$	$\frac{2}{6}$	$\frac{3}{12}$	$\frac{4}{20}$	$\frac{5}{27}$	$\frac{6}{33}$	$\frac{7}{38}$	$\frac{8}{42}$	$\frac{9}{44}$	$\frac{10}{44}$	$\frac{11}{43}$	$\frac{12}{41}$
	.500	.333	.250	.200	.185	.182	.184	.191	.206	.227	.258	.293
Inputs of land per unit of output	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{20}$	$\frac{1}{27}$	$\frac{1}{33}$	$\frac{1}{38}$	$\frac{1}{42}$	$\frac{1}{44}$	$\frac{1}{44}$	$\frac{1}{43}$	$\frac{1}{44}$
	.500	.167	.085	.050	.037	.033	.026	.024	.023	.023	.023	.024

In constructing the curves for these data, the horizontal scale can be made the same as for Figures III to VI, but the vertical scale must be different. The vertical scale also introduces a new difficulty, namely, that it must be chosen to fit two sets of data at the same time, those of seed inputs and those of land inputs.



Total Outputs	2	6	12	20	27	32	38	42	44	44	43	41
Inputs of Seed per Unit of Output	.500	.333	.250	.200	.185	.182	.184	.191	.206	.227	.258	.293
Inputs of Land per Unit of Output	.500	.167	.085	.050	.037	.033	.026	.024	.023	.023	.023	.024

FIG. VII. Inputs per Unit of Output, Land Constant, Seed Varying.

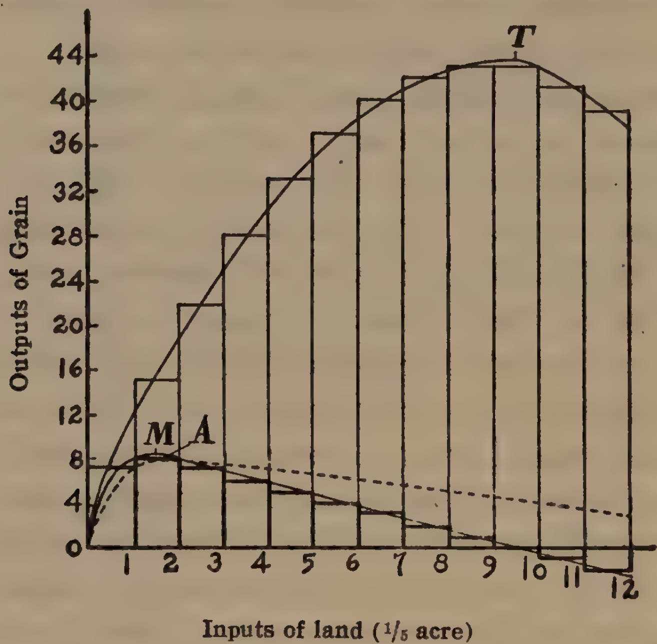
The diagram shows that the least seed is used per unit of output at 6 pecks of input; and the least land per unit of output at some input around 10 pecks. The exact point could be located if the data were given in more detail. The inputs giving least input for seed and for land, or for any other two elements combined in production, are sure to be different. Curves similar to those in Figure VII could be drawn, if data were available, for land and fertilizer, men and machines,

machines and factories, coal and locomotive, salesmen and sales territory. In some cases, the low points would be fairly close together, just as are T and A in the case of some curves of outputs per unit of input; and in some cases very far apart, depending mostly upon how soon the point of diminishing total outputs is reached.

Which Element is Fixed and Which Varying.—In the first illustration chosen, the amount and quality of land was considered as fixed, and the amount of seed was varied. This gave us outputs in terms of inputs of seed. The illustration could just as well have been reversed, with seed fixed as to the amount and quality, and varying amounts of land added. Suppose six pecks of seed is the fixed element, and successive inputs of land, say in doses of $^1/_5$ acre at a time, are added to these six pecks of seed. The curves resulting will be the same general order of curves as when land is considered as fixed, with an increasing portion at the beginning, and a decreasing portion at the end; but they will be different in several important respects. At the beginning, the ratio of seed to land will be very high, as at the end of the preceding curves, with the result that the additional outputs will increase very rapidly. At the start the $^1/_5$ acre of land laid out to be seeded with these 6 pecks of seed will be oversown. Doubling the area of this piece of land will therefore more than double the output. In the diagram in Figure VIII, this increase in additional outputs continues to the middle of the second input of land. (If the inputs of land were one-tenth the size of those in the diagram, there would be fifteen inputs showing increasing additions to output.) After the second input, adding more land will add constantly less to the product—the third input will add less than the second, and the fourth less than the third—until finally with the eleventh input, the total product will actually begin to decline, because there will be more land than can be seeded thickly enough even to produce a fair crop. The weeds will smother the crop. The ratios between seed and land in this part of the curve are the same as in the first part of the curve in Figures III to VI. These two curves therefore reverse each other in certain respects.

The accompanying curve of diminishing total outputs, as one would expect, rises more rapidly at the start than the corresponding curve with land fixed and seed varying; and likewise the curve of average outputs. The point A of diminishing average outputs, or highest output per unit of input, comes only a very little later in this case than the point of diminishing additional output. It comes within the second

input as compared with the sixth input when seed was added to land. The curve of diminishing total outputs in this case is the curve of output per unit of the fixed factor seed, the unit being 6 pecks.



Additional Output.....	7	8	7	6	5	4	3	2	1	0	–1	–2
Total Outputs	7	15	22	28	33	37	40	42	43	43	41	39
Average Outputs......	7	7.5	7.3	7.0	6.6	6.2	5.7	5.2	4.8	4.3	3.7	3.3

FIG. VIII. Outputs with Seed Fixed in Amount and Land Varying.

Thus reversing the position of the two elements from fixed to varying and vice versa produces different curves, but both are curves of increasing and diminishing outputs. The mathematical relationship between inputs and outputs will be the same expressed either way, that is, the total output, output per unit of land, or output per unit of seed, will be the same for the same amounts of seed and land no matter which is fixed and which is changing.

The same will be true if any other two elements are reversed, for example, land and fertilizer, or men and machines, or locomotives and coal.

In actual production processes, certain elements are more frequently fixed than varying; and others more frequently varying than fixed. For example, a farmer usually has a farm of a certain fixed number of acres; and any one machine is usually fixed in size, or any one factory building; and we vary the number of men working on the land or with the machine, or the number of machines installed in a factory building. Such things as labor, raw materials, feed, fuel and supplies of all kinds are usually the varying elements.

Analyzing Combinations with Both Elements Different. One frequently has occasion also to compare inputs and outputs in combinations in which the number of units of both elements are different. Thus one farmer may use 10 pecks on 2 acres of land, and another one 15 pecks upon 5 acres. Let us suppose, for example, that on ten different farms, the combinations of seed and land were as follows:

Farm No.	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*
Units of land	11	9	8	7	6	5	4	3	2	1
Units of seed	11	18	24	28	30	30	28	24	18	10
Input of seed per unit of land	1	2	3	4	5	6	7	8	9	10

The ten farms have been arranged in such order that those with the lowest ratios of seed to land come first, and the others follow in order. So far as the relation of output to input is concerned, a combination of eleven units of seed and eleven units of land is the same as a combination of one unit of each. The total product will be eleven times as great, but not the output per unit of input. Similarly nine units of land and eighteen of seed is the same as 2 and 1, and 5 of land and 30 of seed the same as 6 and 1. In other words, the ratios above computed may be considered as inputs of seed to be combined with a fixed one unit of land. In this way a series of combinations with both elements different in amounts can be reduced very easily to a series with one of the elements fixed, and the analysis can proceed as before.

Given the outputs accompanying the above ten different farms, curves of total, additional and average outputs can be drawn, and likewise of inputs per unit of output.

Being able to attack a problem of this kind in this way is a matter of very great importance in analyzing actual production operations. One way to get actual data showing the outputs accompanying varying inputs applied to a fixed factor, is to set up an experiment. To get the data for Figures III to VI by this method, one would select eleven plots of land exactly equal in size and alike in quality and sow varying amounts of seed upon them. All other conditions, such as moisture, sunlight and labor, would have to be kept constantly and absolutely the same for the eleven plots. This is the method of investigation known as the *experimental method.* The essential idea of it is making all conditions uniform but one, and varying this and noting the results.

Now the experimental method is useful in many lines of work. It gives valuable results at reasonable cost in seed and fertilizer experiments. But it is frequently impracticable in problems where human labor and machines are involved, especially if they are involved in large numbers. The alternative method is the *statistical method*, which consists of collecting and then analyzing by mathematical methods the data of a considerable number of operations carried on under actual conditions, with both elements different in amounts; and as we shall see presently, often with several elements different in amounts. Thus one might visit a hundred shoe stores and count the number of clerks employed and ascertain the stock of goods and floor space and volume of sales and by statistical analysis of the results obtain the same results as one could if it were possible to set up a score or more of experimental stores and work with them for several years. The essence of the statistical method involved in such an analysis is to reduce the various inputs to ratios such as those of seed and land in the above illustration.

II. TWO OR MORE FIXED ELEMENTS WITH ONE CHANGING

In actual production processes, as already explained, usually more than two elements are involved at a time. Barley grown on land uses labor, fertilizer, horses and machines as well as seed. Labor working at a machine uses raw material and supplies and building space. A locomotive uses track and roadbed and cars and labor as well as coal. In the discussion heretofore, we have ignored these other elements or have left them out of consideration for the time being. Some of the remaining elements are generally fixed, like land in the illustration; others are generally varying, like labor. For our next step, we will take cases in which two or more elements are fixed and only one is changing. Let us assume first two series of plots of land of equal size and quality, but upon one of which series no fertilizer has been applied, as in Figures III to VI, and upon the other, 4 hundredweight of fertilizer. To each of these series is applied increasing amounts of barley seed from 1 to 13 pecks. Now in both cases we have a fixed amount of land, but in the second case a fixed amount of fertilizer in addition. How will the results differ in the two cases?

With a small input of seed, the fertilizer will probably make the weeds grow as much more luxuriantly as it will the barley, so that there will be no additional product, probably even a smaller product. As soon, however, as enough seed is sown to keep the weeds down, the

extra plant food in the soil will cause a larger product. The point of diminishing additional outputs will very likely be pushed a little further to the right, and likewise the point of diminishing average outputs. The point of diminishing total outputs will also be affected appreciably, the extra plant food in the soil making it possible for many more plants to obtain food enough to mature properly. The most pronounced effect will be that the whole curve of total outputs will rise more rapidly, after the start, and will rise higher, because of the larger additional outputs. The inputs and outputs would probably be about as follows:—

Inputs of land	1	1	1	1	1	1	1	1	1	1	1	1	1
Inputs of fertilizer	4	4	4	4	4	4	4	4	4	4	4	4	4
Inputs of seed	1	2	3	4	5	6	7	8	9	10	11	12	13
Total outputs	1	4	9	18	28	37	45	52	57	62	63	63	61
Additional outputs	1	3	5	9	10	9	8	7	5	5	1	0	—2
Output per unit of fertilizer[1]	0.25	1.00	2.25	4.50	7.00	9.25	11.25	13.00	14.25	15.50	15.75	15.75	15.25
Output per unit of seed[1]	1.0	2.0	3.0	4.5	5.6	6.2	6.4	6.5	6.3	6.2	5.7	5.2	4.7

Figure IX shows the two sets of curves, without and with fertilizers, side by side. Point M is with the fifth input instead of the fourth in the curve with fertilizer, and represents 2 more units of additional output; Point A is with the eighth input instead of the sixth; and Point T is with the twelfth input instead of the tenth. The greatest total output is 63 bushels in place of 44 with no fertilizer used. In this case it is possible to compute output per unit of fertilizer input as well as of seed input. The curve for this in Fig. IX has its high point at A′. Since the fertilizer input is constant in amount at 4 hundredweight, the curve of output per fertilizer input will follow the curve of total outputs except at a lower level.

If 8 hundredweight of fertilizer had been applied in place of 4 and the same seed applied, results would have been similar to the foregoing, except that the three points would probably have been pushed still farther to the right, and would have risen still higher.

If land and varying amounts of seed, say 4 pecks, then 7 pecks, then 10 pecks, were held fixed and fertilizer applications increased, a similar set of results would be obtained. The three points, T, M and A would be farther to the right and higher with 7 pecks of seed held fixed than with 4, and still farther to the right and higher with 10 pecks than with 7 pecks.

[1] The expression, "per unit of" as here used must not be understood as implying that the resulting output is *due to* the fertilizer or the seed, but merely in ratio to them as indicated.

The same analysis would apply if a factory and a certain number of machines or machine units were held fixed and labor increased. This would in effect amount to varying the number of men per machine

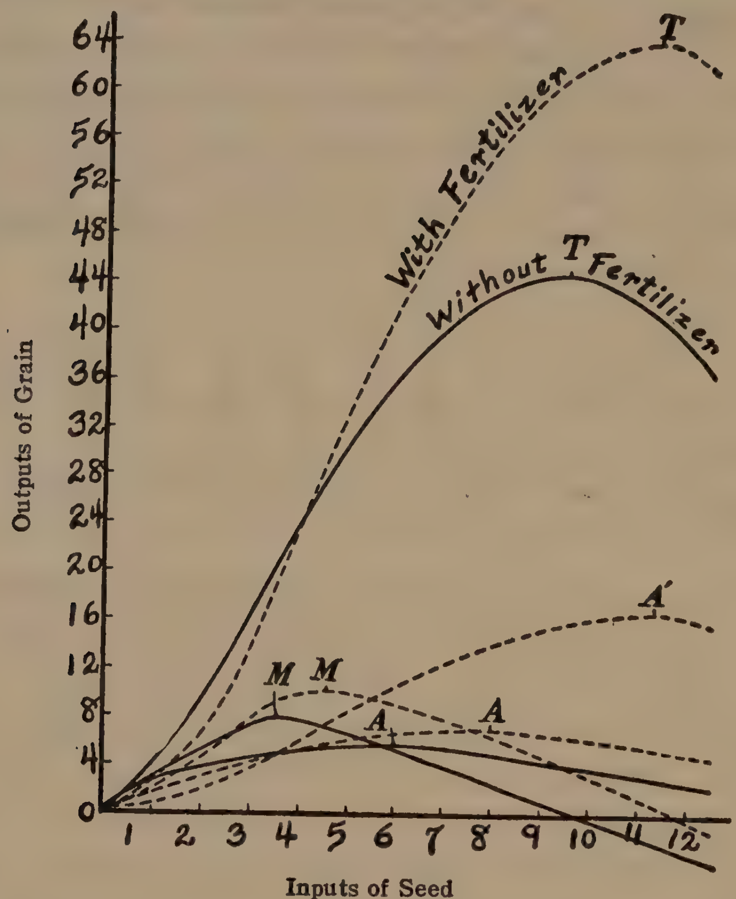


Fig. IX. Diminishing Outputs with One Fixed Element, Land, and with Two Quantities of Fertilizer.

Solid lines ——————— without fertilizer
Broken lines– – – – – – –with fertilizer

unit. Let us assume, for example, a factory with 4 machine units, and labor added to the factory in units of 4 men at a time. The results might be as follows:—

Inputs of factory	1	1	1	1	1	1	1	1	1	1
Inputs of machines	4	4	4	4	4	4	4	4	4	4
Inputs of men per machine	1	2	3	4	5	6	7	8	9	10
Inputs of men per factory	4	8	12	16	20	24	28	32	36	40
Total outputs	0	20	48	80	108	128	140	144	146	140
Outputs per machine input	0	5	12	20	27	32	35	36	36.5	35
Outputs per man input	0	2.5	4.0	5.0	5.4	5.3	5.0	4.5	4.1	3.5

In actual factory operation, if only 4 men were available, they would of course all be put to work on one machine, and would turn out a

total product of 20. (If 16 men and 4 machines turn out 80, then 4 men and 1 machine will turn out 20.) This means that the other 3 machines would stand idle. It has been assumed in this case, in order to give illustrative data, that all 4 machines would be used, and under these circumstances, no product at all would probably result. With 8 men available working with 4 machines, the total product is 20; with 12 men working with 4 machines, the product is 48. The largest output per man input is at 5 men per machine, or 20 per factory. The largest output per machine is at 9 men per machine, or 36 per factory. Since factory and machines are fixed, highest output per factory and per machine come at the same place.

Now if this factory were equipped with 8 machines in place of 4, and the same number of men were added in units of 4, the results would be as follows:—

Inputs of factory	1	1	1	1	1	1	1	1	1	1
Inputs of machines	8	8	8	8	8	8	8	8	8	8
Inputs of men per machine	½	1	1½	2	2½	3	3½	4	4½	5
Inputs of men per factory	4	8	12	16	20	24	28	32	36	40
Total outputs	0	0	16	40	64	96	128	160	192	216
Outputs per machine	0	0	2	5	8	12	16	20	24	27
Outputs per man	0	0	1.3	2.5	3.2	4.0	4.6	5.0	5.3	5.4

Continued	1	1	1	1	1	1	1	1	1	1
	8	8	8	8	8	8	8	8	8	8
	5½	6	6½	7	7½	8	8½	9	9½	10
	44	48	52	56	60	64	68	72	76	80
	240	256	272	280	288	288	288	288	288	280
	30	32	34	35	36	36	36	36	36	35
	5.4	5.3	5.2	5.0	4.8	4.5	4.2	4.0	3.8	3.5

First, it is to be noted that the point of diminishing total outputs is approximately at 68 men in place of 32 before; second, that the total output at this point has been doubled; and third, that at 32 men inputs and beyond, the total outputs are increased as a result of giving the men 8 machines to work with instead of 4, and likewise the outputs per man; but before this point, both the total outputs and the outputs per man are less because of the extra 4 machines. Thus 8 machines and 32 men produce an output per man of 5.0, as compared with 4.5 for 4 machines and 32 men; but 8 machines and 24 men produce an output per man of only 4.0, as compared with 5.3 for 4 machines and 24 men. This is because the men waste time trying to keep too many machines in operation. According to these figures, if the number of men were held fixed, and the number of machines increased, any num-

ber of machines beyond 1 for each 4 men would produce diminishing total outputs. This part of the phenomenon is comparable to that previously pointed out for fertilizers applied with a small amount of seed. Lastly, the outputs per machine are less with 8 machines than with 4, with anything less than 68 men, the point of diminishing total outputs. Figure X shows the curves for these two sets of data. The broken lines are the curves for the 8 machines and the solid lines for

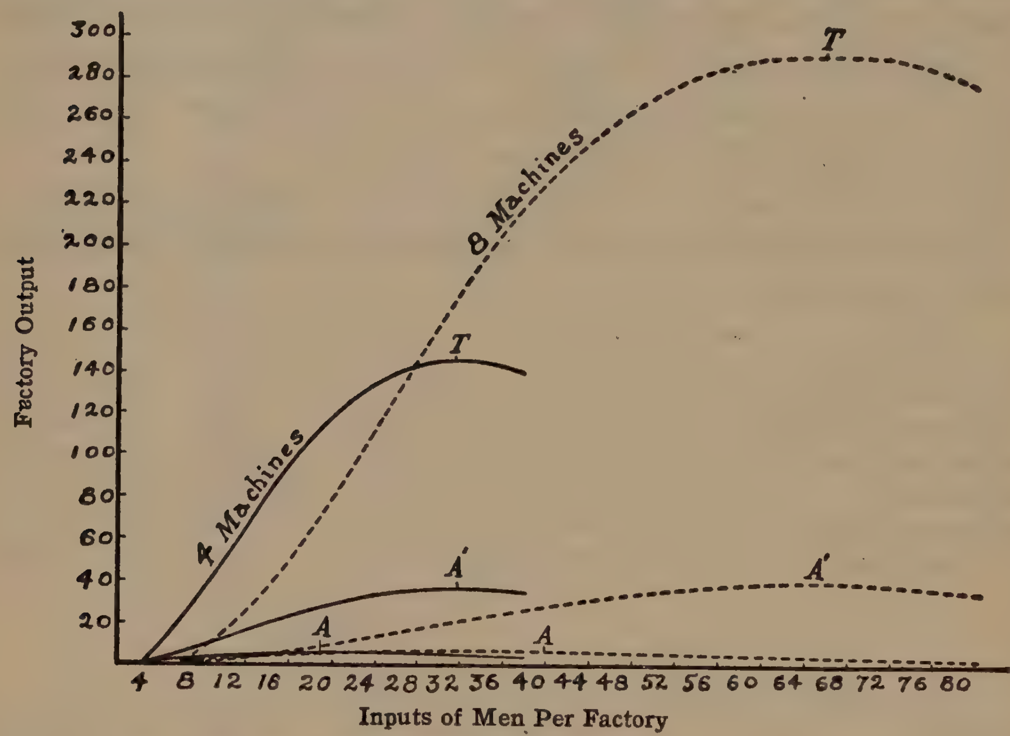


FIG. X. Diminishing Outputs with Factory Fixed and Labor Varying, and with Two Different Numbers of Machines.

the 4 machines. Points T indicate highest output per factory; A, highest output per man; and A′, highest output per machine.

Let us suppose 12 machines are used instead of 8. The chances are that either before this point or soon after it, a new factor will enter into the problem, namely, that the factory will not be large enough to accommodate this number of machines to advantage. In this case, the output per man and per machine would both be reduced. Moreover, the different parts of the curve would be affected differently; for example, the crowding of the machines would produce more serious results with 8 men employed per machine than with 4. The effect of this would be to cause the points of total and average diminishing outputs to come earlier than otherwise would be the case.

The inference to be drawn from this is that when 2 elements are fixed and one varying, the effect of the varying element of production

on the output is influenced by the relation between the two fixed elements. In this case, the relation between the machines and the factory building modifies the effect of varying the number of men.

We might have called attention to the same phenomenon in the case of land, barley seed and fertilizer. If an amount of fertilizer were applied to the land beyond the point of diminishing total outputs for fertilizer applied to land, the curve of outputs per unit of seed input would be very greatly affected thereby. An amount of fertilizer near to the point of diminishing total outputs for fertilizer will give an appreciably different set of curves for varying seed inputs than any amount of fertilizer less than this.

The easiest illustration of this is that of the effect of water upon the effectiveness of other elements of production in growing crops. The curves of outputs for varying amounts of seed or fertilizer or labor applied to a growing crop will be higher, and reach total diminishing outputs later, in a moderately wet year than in a dry year; also if enough irrigation water is applied than if only a little is applied. If, on the other hand, the year is too wet or if too much irrigation water is applied, the curves will all be lower, and reach Point T sooner than if the moisture supply had been moderate. The effect of varying amounts of labor upon the output will be influenced differently from the effect of varying amounts of fertilizer. The function of water in the soil is to take plant food into solution so that it can be taken up by the roots of the plant. Too little water will not take up enough plant food; too much will make so diluted a solution that the plant cannot handle enough of it to procure the food supply necessary for rapid growth. Besides, plants need soil air in order to grow; too much water "smothers" the roots. A crop that is cultivated frequently can therefore stand more moisture than one which is not—the cultivation lets air into the soil. The curves for increasing labor may therefore be more favorably influenced by more water than the curves for seed or fertilizer. The amount of sunlight also profoundly influences the effect of water upon a crop. Plants take up much more soil water upon a bright day than upon a cloudy day.

In a factory, the effectiveness of varying amounts of labor depends upon the amount of power applied to the machines, and perhaps the speed at which they are driven; also upon the amount of supervision that is given the labor.

The effect of increasing or decreasing the number of salesmen work-

ing in a given territory will depend upon the supervision they receive and upon the advertising campaign that goes with it.

All of these illustrations point to a universal principle, namely, that if *several elements are associated in a production process, the effect on the output of varying any one of them is dependent upon its relation to all the other elements and also upon the effects of the other elements upon each other.*

III. SEVERAL FIXED ELEMENTS

The illustrations thus far worked out involve two fixed elements and one changing element. In many actual production processes, several elements are fixed. In factories, for example, management may be fixed as well as plant and equipment. The practical problem that sometimes arises is how much raw material to attempt to put through a given plant in a day with a fixed labor and management force; or at what rate to drive the machines. In small manufacturing plants, it is frequently the case that everything is fixed except the amount of raw material available, and some of the time the factory is operating at more than capacity and much of the time at less than capacity. This is also true in small retail stores with their fixed plant, equipment, management, and, for the most part, labor supply.

The presence of a third fixed element does not change the analysis in any way—it merely introduces another element whose amount will modify the effectiveness of the varying element. If the third fixed element were added as a new element in the production process—as if a manufacturer were to add a statistical department, or as if the sales department were to start an advertising program to help out its salesmen, and the innovation were to prove effective, then the curves for all the elements would be raised and in most cases extended. A case in which they might be raised, but shortened rather than extended, is the one just mentioned of complementing sales work with advertising—the advertising may take the place in part of the regular sales work with the result that highest output per salesman is obtained with fewer salesmen than before.

Inputs per Unit of Output.—When three elements of production are involved in a production process, or for example, land, seed, and fertilizer as in Figure IX, three curves of inputs per unit of output can be drawn. This is done in Figure XI for the data of Figure IX. The data for the curve of land inputs are obtained by dividing 1 by the series of total outputs varying from 1 to 61, and the data for the curve

of fertilizer inputs by dividing 4 by the same series of total outputs. The data for the curve of seed inputs are obtained by dividing the series of seed inputs, ranging from 1 to 13 pecks, by the series of total outputs. The low points for land and fertilizer inputs necessarily come one above the other, since both represent fixed elements. The low point for seed inputs, A, comes in the eighth seed input, as does the point of diminishing average outputs of which it is the counterpart.

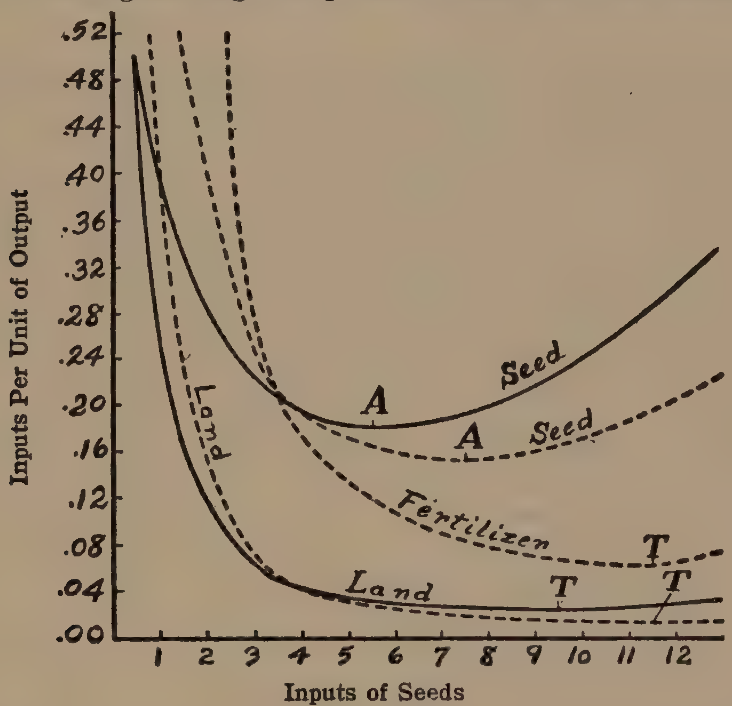


FIG. XI. Inputs per Unit of Output, with Two Fixed Elements, Land and Fertilizer.

Solid lines ——————— without fertilizer

Broken lines- - - - - - - - with fertilizer

It will be noted that both land and seed inputs per bushel of barley, except at the very beginning, are less in Figure XI than in Figure VII, but there are now fertilizer inputs in addition. In a sense, the fertilizer inputs have taken the place of some of the land and seed inputs in production. But has the cost of production been reduced thereby? This is a question that will be taken up in the next chapter.

IV. ONE FIXED ELEMENT, TWO VARYING

It also frequently happens that two or more elements of production are varied at a time. Thus along with more seed, the farmer may apply more fertilizer and more labor. Figure XII shows the total outputs under such circumstances. The total outputs for the different inputs of seed with no fertilizer and with 4 units of fertilizer are the same as in

Figure IX. Similar curves of outputs could be drawn for each of the 12 different inputs of fertilizer, using the data of Figure XII. In each case, the land and the given amount of fertilizer are the fixed elements, and the seed is the varying element. With 1 unit of fertilizer held fixed along with the land, the largest total output comes at 10½ inputs of seed; with 4 units of fertilizer, at nearly 12 inputs of seed. Thus with the larger amounts of fertilizer, the point T of diminishing outputs is

Inputs of Fertilizer \ Inputs of Seed	2	3	4	5	6	7	8	9	10	11	12	13	14	15
11	0	0	6	17	26	34	40	45	48	50	51	50	48	44
10	0	2	9	20	32	41	51	59	65	71	74	75	71	60
9	1	4	11	22	34	46	57	65	70	75	78	79	72	61
8	1	5	13	24	37	49	57	65	69	74	77	78	71	59
7	2	6	14	25	38	48	56	63	68	72	74	76	68	56
6	2	7	15	27	38	47	55	62	67	70	71	73	64	52
5	3	8	17	28	38	47	54	60	64	67	68	68	59	47
4	4	9	18	28	37	45	52	57	61	63	63	61	55	42
3	4	10	19	28	36	43	49	52	56	57	56	54	47	36
2	5	11	20	28	35	40	45	48	51	52	51	47	40	26
1	6	12	20	27	33	38	42	45	47	47	45	40	33	18
0	6	12	20	27	33	38	42	44	44	43	40	34	24	12

T V V′ X V T

Fig. XII. Total Outputs With One Fixed Element and Two Varying Elements.

extended till it comes well within the 13th input of seed at the 9th input of fertilizer. Total outputs increase up to 9 inputs of fertilizer and then decrease. The line T T′ shows the location of the points of total decreasing returns, seed inputs varying with the different amounts of fertilizer held fixed. With more than 10 inputs of fertilizer held fixed, the point T comes sooner than with a little less fertilizer. This amount of fertilizer is excessive, causing diminishing total outputs at all seed inputs, and under these circumstances, the point of diminishing total outputs for seed applications comes earlier than it would with less fertilizer.

If the analysis is reversed, and land and seed are considered as fixed elements, first with 2 pecks of seed, then with 3 pecks, then with 4

pecks, etc., the fertilizer inputs varying from 0 to 11 units, the largest total output with either 3 or 4 pecks of seed held fixed is obtained with no fertilizer; with 5 pecks of seed fixed, at 3 or 4 inputs of fertilizer; with 7 pecks of seed fixed, at 8 inputs of fertilizer; and with 12 pecks

Legend (each cell, top to bottom): -Land -Fertilizer -Seed

Inputs of Fertilizer	2	3	4	5	6	7	8	9	10	11	12	13	14	15
11	----- ----- -----	----- ----- -----	6.00 .54 1.50	17.00 1.54 3.40	26.00 2.36 4.33	34.00 3.09 4.86	40.00 3.64 5.00	45.00 4.09 5.00	48.00 4.36 4.80	50.00 4.54 4.54	51.00 4.64 4.25	50.00 4.54 3.85	48.00 4.36 3.43	44.00 4.00 2.93
10	----- ----- -----	2.00 .20 .66	9.00 .90 2.25	20.00 2.00 4.00	32.00 3.20 5.33	41.00 4.10 5.86	51.00 5.10 6.37	59.00 5.90 6.55	65.00 6.50 6.50	71.00 7.10 6.45	74.00 7.40 6.17	75.00 7.50 5.77	71.00 7.10 5.07	60.00 6.00 4.00
9	1.00 .11 .50	4.00 .44 1.33	11.00 1.22 2.75	22.00 2.44 4.40	34.00 3.78 5.67	46.00 5.11 6.57	57.00 6.33 7.12	65.00 7.22 7.22	70.00 7.78 7.00	75.00 8.33 6.82	78.00 8.67 6.50	79.00 8.78 6.08	72.00 8.00 5.14	61.00 6.78 4.07
8	1.00 .12 .50	5.00 .62 1.66	13.00 1.62 3.25	24.00 3.00 4.80	37.00 4.62 6.17	49.00 6.12 7.00	57.00 7.12 7.12	65.00 8.12 7.22	69.00 8.62 6.90	74.00 9.25 6.73	77.00 9.62 6.42	78.00 9.75 6.00	71.00 8.88 5.07	59.00 7.38 3.93
7	2.00 .29 1.00	6.00 .86 2.00	14.00 2.00 3.50	25.00 3.57 5.00	38.00 5.43 6.33	48.00 6.86 6.86	56.00 8.00 7.00	63.00 9.00 7.00	68.00 9.71 6.80	72.00 10.29 6.55	74.00 10.57 6.17	76.00 10.86 5.85	68.00 9.71 4.86	56.00 8.00 3.73
6	2.00 .33 1.00	7.00 1.17 2.33	15.00 2.50 3.75	27.00 4.50 5.40	38.00 6.33 6.33	47.00 7.83 6.71	55.00 9.17 6.88	62.00 10.33 6.89	67.00 11.17 6.70	70.00 11.67 6.36	71.00 11.83 5.92	73.00 12.17 5.62	64.00 10.67 4.57	52.00 8.67 3.47
5	3.00 .60 1.50	8.00 1.60 2.66	17.00 3.40 4.25	28.00 5.60 5.60	38.00 7.60 6.33	47.00 9.40 6.71	54.00 10.80 6.75	60.00 12.00 6.67	64.00 12.80 6.40	67.00 13.40 6.09	68.00 13.60 5.67	68.00 13.60 5.23	59.00 11.80 4.21	47.00 9.40 3.13
4	4.00 1.00 2.00	9.00 2.25 3.00	18.00 4.50 4.50	28.00 7.00 5.60	37.00 9.25 6.17	45.00 11.25 6.43	52.00 13.00 6.50	57.00 14.25 6.33	61.00 15.25 6.10	63.00 15.75 5.73	63.00 15.75 5.25	61.00 15.25 4.69	53.00 13.25 3.78	42.00 10.50 2.80
3	4.00 1.33 2.00	10.00 3.33 3.33	19.00 6.33 4.75	28.00 9.33 5.60	36.00 12.00 6.00	43.00 14.33 6.14	49.00 16.33 6.12	52.00 17.33 5.78	56.00 18.66 5.60	57.00 19.00 5.18	56.00 18.66 4.67	54.00 18.00 4.15	47.00 15.66 3.36	36.00 12.00 2.40
2	5.00 2.50 2.50	11.00 5.50 3.66	20.00 10.00 5.00	28.00 14.00 5.60	35.00 17.50 5.83	40.00 20.00 5.71	45.00 22.50 5.62	48.00 24.00 5.33	51.00 25.50 5.10	52.00 26.00 4.73	51.00 25.50 4.25	47.00 23.50 3.62	40.00 20.00 2.86	26.00 13.00 1.73
1	6.00 6.00 3.00	12.00 12.00 4.00	20.00 20.00 5.00	27.00 27.00 5.40	33.00 33.00 5.50	38.00 38.00 5.43	42.00 42.00 5.25	45.00 45.00 5.00	47.00 47.00 4.70	47.00 47.00 4.27	45.00 45.00 3.75	40.00 40.00 3.08	33.00 33.00 2.36	18.00 18.00 1.20
0	6.00 ----- 3.00	12.00 ----- 4.00	20.00 ----- 5.00	27.00 ----- 5.40	33.00 ----- 5.50	38.00 ----- 5.43	42.00 ----- 5.25	44.00 ----- 4.89	44.00 ----- 4.40	43.00 ----- 3.91	40.00 ----- 3.33	34.00 ----- 2.62	24.00 ----- 1.71	12.00 ----- .80

Inputs of Seed

FIG. XIII. Outputs per Unit of Input, Land Fixed and Seed and Fertilizer Varying.

of seed fixed, at 9 inputs of fertilizer. The line V V′ marks the largest total outputs with the different amounts of seed held fixed along with the land, and fertilizer varying from 0 to 11 in each case. With more than 13 pecks of seed held fixed, total outputs diminish sooner than with a little less seed. This amount of seed is excessive, causing diminishing total outputs at all fertilizer inputs, but in this case, the

point of total diminishing outputs for fertilizer applications has not come earlier than it would with less seed.

The effect of using more fertilizer is to cause more seed to give maximum outputs up to 9 inputs of fertilizer. The effect of using more seed is to cause more fertilizer to give maximum outputs up to 13 inputs of seed. By increasing seed inputs alone with no fertilizer, the maximum output obtained is 44; by increasing both together, the maximum output can be increased to 79 at point X with 9 inputs of fertilizer and 13 of seed. Beyond this point, both fertilizer and seed are excessive, and maximum outputs fall off rapidly. Before X, the good effects of more seed and more fertilizer are working together, in a sense multiplying into each other, that is, each unit of seed has more fertilizer to work with, and each unit of fertilizer has more seed to work with. Beyond X, the bad effects are multiplying into each other.

From the diagram, one can determine the total outputs with each seed or fertilizer input varying separately or with the two varying at the same time in either direction or at any rate.

Figure XIII shows, reading from left to right, varying outputs per unit of seed input and of fertilizer input, with land and varying amounts of fertilizer fixed and seed inputs varying; and reading from bottom to top, the same outputs per unit of input, but with seed inputs fixed and fertilizer inputs varying. The upper figure in each square is output per unit of land; the middle figure, output per unit of fertilizer, and the bottom figure, output per unit of seed. The same inputs of seed and fertilizer give the same per-unit outputs no matter which is fixed and which is varying. The curve AA′ includes the points of highest output per unit of the varying element seed, and the curve TT′, the points of highest total outputs, or outputs per unit of land. As one would expect, the curves are roughly parallel; that is, the later that total outputs begin to diminish, the later also that average outputs are likely to begin to diminish.

Figure XIV presents inputs of land, seed and fertilizer accompanying the varying inputs of seed and fertilizer indicated in Figures XII and XIII. The land inputs were obtained by dividing 1 by the total outputs, in this case, total outputs varying in two dimensions according to changing inputs of both seed and fertilizer; the seed inputs by dividing the series of seed inputs from 2 to 15 by the same set of total outputs; and the fertilizer inputs by dividing the series of fertilizer inputs from 1 to 11 by the same set of total outputs. The inputs vary both with the quantity of fertilizer and the quantity of seed used.

As in the foregoing example, seed and fertilizer are in effect varied at the same time, so in a factory the number of machines and number of men may be varied at the same time. The number of men may be varied either according to the number of machines, or at a different

Inputs of Fertilizer \ Inputs of Seed	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
11	----- ----- -----	----- ----- -----	.1666 1.8333 .6666	.0588 .6471 .2941	.0385 .4231 .2308	.0294 .3236 .2058	.0250 .2750 .2000	.0222 .2445 .2000	.0208 .2291 .2083	.0200 .2200 .2200	.0196 .2155 .2353	.0200 .2200 .2600	.0208 .2293 .2917	.0227 .2500 .3409	-Land -Fertilizer -Seed
10	----- ----- -----	.5000 5.0000 1.5000	.1111 1.1111 .4444	.0500 .5000 .2500	.0312 .3125 .1876	.0244 .2439 .1707	.0196 .1961 .1569	.0169 .1694 .1526	.0154 .1538 .1538	.0141 .1408 .1550	.0135 .1351 .1621	.0133 .1333 .1733	.0141 .1408 .1972	.0167 .1667 .2500	
9	1.0000 9.0000 2.0000	.2500 2.2500 .7500	.0909 .8181 .3636	.0454 .4091 .2273	.0291 .2647 .1764	.0217 .1957 .1522	.0175 .1579 .1404	.0154 .1385 .1385	.0143 .1285 .1428	.0133 .1200 .1466	.0128 .1153 .1538	.0126 .1140 .1645	.0139 .1250 .1945	.0164 .1475 .2459	
8	1.0000 8.0000 2.0000	.2000 1.6000 .6000	.0769 .6153 .3077	.0417 .3333 .2083	.0270 .2163 .1621	.0204 .1633 .1428	.0175 .1404 .1404	.0154 .1231 .1385	.0145 .1160 .1449	.0135 .1081 .1486	.0130 .1039 .1558	.0128 .1025 .1667	.0141 .1126 .1972	.0169 .1355 .2543	
7	.5000 3.5000 1.0000	.1666 1.1666 .5000	.0714 .5000 .2857	.0400 .2800 .2000	.0263 .1842 .1580	.0208 .1458 .1458	.0179 .1250 .1428	.0159 .1111 .1428	.0147 .1030 .1471	.0139 .0972 .1527	.0135 .0946 .1621	.0132 .0921 .1710	.0147 .1029 .2058	.0179 .1250 .2680	
6	.5000 3.0000 1.0000	.1429 .8571 .4285	.0666 .4000 .2667	.0357 .2222 .1852	.0263 .1579 .1579	.0213 .1277 .1490	.0182 .1091 .1454	.0161 .0968 .1451	.0149 .0895 .1492	.0143 .0857 .1572	.0141 .0844 .1689	.0137 .0822 .1780	.0156 .0937 .2188	.0192 .1153 .2884	
5	.3333 1.6667 .6667	.1250 .6250 .3750	.0588 .2941 .2353	.0357 .1786 .1786	.0263 .1316 .1580	.0213 .1064 .1490	.0185 .0926 .1481	.0167 .0833 .1500	.0156 .0781 .1562	.0149 .0746 .1642	.0147 .0735 .1764	.0147 .0735 .1912	.0169 .0847 .2373	.0213 .1063 .3192	
4	.2500 1.0000 .5000	.1111 .4444 .3333	.0555 .2222 .2222	.0357 .1429 .1786	.0270 .1081 .1621	.0222 .0889 .1555	.0192 .0769 .1538	.0175 .0702 .1578	.0164 .0655 .1639	.0159 .0635 .1746	.0159 .0635 .1905	.0164 .0656 .2132	.0182 .0754 .2641	.0238 .0952 .3571	
3	.2500 .7500 .5000	.1000 .3000 .3000	.0526 .1578 .2105	.0357 .1072 .1786	.0277 .0833 .1667	.0232 .0698 .1629	.0204 .0612 .1633	.0192 .0577 .1730	.0179 .0536 .1786	.0175 .0526 .1929	.0179 .0535 .2143	.0185 .0555 .2408	.0213 .0639 .2978	.0278 .0833 .4167	
2	.2000 .4000 .4000	.0909 .1818 .2727	.0500 .1000 .2000	.0357 .0714 .1786	.0286 .0571 .1715	.0250 .0500 .1750	.0222 .0444 .1778	.0208 .0417 .1876	.0196 .0392 .1961	.0192 .0385 .2114	.0196 .0392 .2353	.0213 .0425 .2765	.0250 .0500 .3500	.0385 .0769 .5769	
1	.1666 .1666 .3333	.0833 .0833 .2500	.0500 .0500 .2000	.0370 .0370 .1852	.0303 .0303 .1818	.0263 .0263 .1842	.0238 .0238 .1905	.0222 .0222 .2000	.0213 .0213 .2128	.0213 .0213 .2340	.0222 .0222 .2667	.0250 .0250 .3250	.0303 .0303 .4242	.0555 .0555 .8333	
0	.1666 ----- .3333	.0833 ----- .2500	.0500 ----- .2000	.0370 ----- .1852	.0303 ----- .1818	.0263 ----- .1842	.0238 ----- .1905	.0232 ----- .2045	.0227 ----- .2273	.0232 ----- .2558	.0250 ----- .3000	.0294 ----- .3823	.0417 ----- .5833	.0833 ----- 1.2500	

FIG. XIV. Inputs per Unit of Output, Land Fixed and Seed and Fertilizer Varying.

rate than the number of machines. Thus the factory might take on 4 men with each new machine, or it might use 2 men per machine with a few machines installed, then 3 men per machine as more machines were installed, then 4 men per machine, then 5 men per machine, etc.

In the first case, with men and machines varying in proportion, the analysis is relatively simple. The unit of input in such a case is really 1 machine plus 4 workmen. The outputs can be computed per machine and 4 workmen combined. Of course it can also be computed per man, but it will be the same with each of the 4 men added with 1 machine, since they are all added at the same time with the machine. The inputs per unit of output will have to be computed in terms of amounts of machine and man-labor separately, since it is not possible to add hours of machine-labor and hours of man-labor together, any more than it is cords of wood and tons of coal. But the two curves of inputs of machine-labor and of inputs of man-labor will follow each other throughout and have their low points exactly one above the other.

In the second case, with number of men per machine varying as well as number of machines, the analysis will be the same as for land, seed and fertilizer as given above. For any fixed number of machines in the factory, there will be a curve of total outputs with varying inputs of men, such as are presented for 4 and 8 machines respectively in an earlier section of this chapter. Similar curves could be constructed for other numbers of machines from 1 to 10; and thus a complete set of total outputs devised similar to those of Figure XII above; and likewise sets of average outputs per unit of input and of inputs of factory, machine-labor and man-labor per unit of output, similar to those of Figures XIII and XIV respectively. These would show total factory outputs increasing with the number of machines to point T, but the location of point T varying with the number of men used per machine; also total factory outputs increasing to a point V with the number of men, but the location of point V varying with the number of machines in the factory.

The principal consideration in factory production is volume of output needed to fill orders. Suppose a growing factory business had orders for only 40 barrels of its product at the start, but that its sales gradually increased to over 600 barrels. Suppose it undertook to manufacture these varying amounts using first 2 machines with 2 men each, then 3 machines with 3 men each, and so on as indicated following, to 10 machines and 6 men each. The results might be as follows:

Number of machines	*Number of men per machine*	*Number of men per factory*	*Total factory output*	*Output per machine*	*Output per man*
2	2	4	40	20	10
3	3	9	153	51	17
4	4	16	320	80	20
5	4	20	400	80	20
6	4	24	480	80	20
7	4	28	560	80	20
8	4	32	624	78	19.5
9	5	45	630	70	14
10	6	60	600	60	10

With 4 men per machine and anywhere from 4 to 7 machines in the factory, the output per man and per machine is constant. This is a condition very common in factory production. The plant is really built to run on this basis. This is "normal" production for it. When the 8th machine is installed, however, the outputs per unit and per man fall off a little, even though the same number of men are used, probably because the factory has become a little crowded with machines. With 9 and 10 machines, the condition becomes still worse, and probably the increase in number of men per machine is also producing adverse effects. The total input is increased up to 9 machines and 5 men per machine, but any more machines and men than these are clearly excessive. With less than 4 men per machine, the outputs per man and per machine are also low, perhaps because of too few machines per factory, probably because of too few men per machine, possibly because of both. It is impossible to tell which from the data here given. But if the manufacturer had a complete set of figures such as those of Figures XII and XIII, he could determine the accountability for all these changes.

V. SEVERAL FIXED AND CHANGING ELEMENTS

If there were three varying elements in place of two,—for example, if labor varied as well as seed and fertilizer,—the analysis would be more complicated, particularly more difficult to show graphically, but the principles would be the same. The method of explanation would, let us say, first hold both a definite amount of seed fixed and a definite amount of fertilizer fixed along with the land, while varying labor with each, and then each of the other amounts of seed fixed along with the different amounts of fertilizer while varying the labor inputs. When the analysis was completed, we would know what

combination of all these gave the maximum total output, and how any lesser amount of any of the others reduced the output. The outputs accompanying varying inputs of fertilizers would be affected by the amounts of both seed and labor used; and likewise the outputs for varying inputs of the other two elements. With four elements combined in production, one fixed and three varying, there are the following relationships involved:

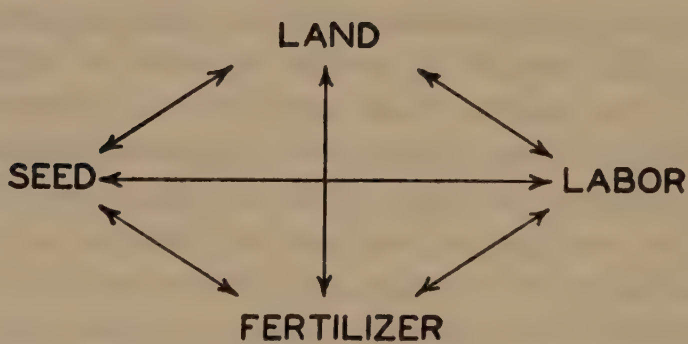
The effect of the fixed element land upon the effect of the three varying elements upon the output.

The effect of changes in amounts of seed upon the effect of both fertilizer and labor upon the output.

The effect of changes in amounts of fertilizer upon the effect of both labor and seed upon the output.

The effect of changes in the amounts of labor upon the effect of both seed and fertilizer upon the output.

The following diagram helps to visualize all the possible interrelationships between as many as four production elements. It



indicates not only all the possible inter-effects, but also that these inter-effects are mutual.

Fortunately, however, in actual analysis, changes in some of the elements frequently have no effect upon changes in others. For example, in the case of the factory and number of men and machines, any number of machines between 4 and 7 clearly had no effect upon the average outputs, and probably any number from 1 to 7 machines. The amount of seed planted per acre, or fertilizer used, affect planting labor very little if any—its effect is mostly upon the harvesting operations.

Also very many of the elements of production are essentially fixed and vary very little with the other inputs. Thus most plant costs, such as depreciation, interest, heat, light and water, vary very little with the inputs of the other elements. The same is true of much of

the cost of management. Also in many cases some of the elements vary in proportion to each other.

Thus any actual production problem is likely to involve several types of relationships. This can be illustrated very simply by the operation of churning and butter-working as it is performed in a combined churn and butter-worker. Table X shows about the way in which this operation would be performed in a butter-factory as the input of cream increased. The elements are the fixed churn, and the floor space occupied by it, including work-space around it; the raw material, cream; the supplies—salt and butter-color; and power and labor. The raw material and supplies and output vary in exact proportion to each other. (See Columns I, II and V in the table.) Labor varies with the raw material, but not in proportion—the labor of removing the butter from the churn is nearly proportional to raw material, but not the supervising of the churning and the making of the moisture tests and salt test or the washing out of the churn after the operation. (See Column III.) Power also varies with the raw material, but not in proportion—it takes considerable power to run a churn empty, and the smaller the load, the larger the proportion this is of the total; also either a light load or a full load takes longer to churn than a moderate load. (Column IV.) The fixed elements, churn and space, do not limit the changes in the other elements except power as already mentioned.

TABLE X. INPUTS AND OUTPUTS WITH SEVERAL CHANGING FACTORS—A CHURNING OPERATION TAKEN AS AN EXAMPLE

I	II	III	IV	V	VI	VII	VIII
	INPUTS OF—				AVERAGE OUTPUTS PER UNIT OF—		
Cream (hundred-weight)	*Salt (lbs.)*	*Labor (min.)*	*Power (h.p.-min.)*	*Output (lbs.)*	*Cream*	*Labor*	*Power*
5	2	26	140	125	25	4.8	0.9
10	4	28	150	250	25	8.9	1.7
15	6	30	157	375	25	12.5	2.4
20	8	33	164	500	25	15.1	3.1
25	10	36	165	625	25	17.3	3.8
30	12	39	192	750	25	19.2	3.9
35	14	43	221	875	25	20.2	4.0
40	16	47	252	1000	25	21.3	4.0
45	18	51	285	1125	25	22.1	4.0
50	20	55	320	1250	25	22.7	3.9

Hence the analysis of this problem can in effect be reduced to four elements: a fixed element, A, including the churn and space; and three varying elements—B, including the raw materials and supplies, C, power, and D, labor. But raw material and supplies are strictly proportional to each other and to output. (Column V.) Output per unit of power is nearly constant from 500 on, decreasing slightly at the end. (Column VIII.) This would be called a 1200-pound churn, which means that it gives best service at this output.

We may take as another illustration a grocery store. The fixed element is the store building and equipment. The varying elements are the stock of goods received, labor, delivery trucks, supplies (paper, twine, gasoline, etc.) and advertising. The output is really the time, place and possession benefits created. The best practical measure of this would probably be amount of sales plus inventory. Output per unit of input of goods would be obtained by dividing value of sales plus inventory by value of purchases. The output will vary per building according to the rate of turnover of goods, but rate of turnover is limited somewhat by the size of the building. Output per unit of labor is closely related to, but not proportional to input of goods and turnover. Input of advertising also frequently affects output per unit of labor and turnover. Some supplies are proportional to output and some are not.

Summary.—The objective which we stated at the beginning of the chapter was to develop the principles governing the relation between the proportions of the elements of production and outputs. We began this by taking first one fixed element and one varying element and developing out of their behavior in combination the Principle of Diminishing Physical Outputs in terms of total, additional, and average outputs. We showed that the principle was equally true whether we held land or fertilizer fixed.

Next we held two elements fixed and varied one and discovered that the same principle maintains as with one fixed element, but that the position of the curves is changed. The same is true with any number of fixed elements. But the several fixed elements may modify the effect of the varying element in different ways and degrees.

Next we held one element fixed and varied two of them and found that the same principle maintains, but that its operation is greatly complicated by the effects which the changes in the two varying elements have upon each other. Several changing elements in place of two would simply multiply the number of these inter-effects.

Next we showed that actual production operations frequently involve a number of fixed and a number of varying elements, some of the latter of which vary in proportion to each other, and some independently of each other. No new principles are involved in such situations, but the analysis is complicated by the multiplicity of the interrelationships involved.

We also discussed the problem arising when a large number of plants or operations are studied which have no one element equal in all of them. This is equivalent to having no fixed element. We showed in each case how statistical method furnishes a method of solution by in effect reducing the proportion of the elements to ratios in which the quantity of one of the elements is always 1, and hence equivalent to a fixed factor. This method can be used with many elements as well as with two.

Finally, in each of the above cases, whether two or several elements were involved, we converted by simple arithmetical processes the data and curves of average outputs and total outputs into curves of inputs of the several elements per unit of output. In this form, the data are extremely useful for many purposes.

Principles Restated.—While the Principle of Diminishing Physical Outputs as stated above in terms of one fixed and one varying element serves as a basis of an explanation of the results where several elements are combined, it really does not include such combinations, and clearly it should do so if it is to rank as a universal principle. Most economists have been content, it is true, to express it in the terms of one fixed and one varying element; but this practice is hardly justifiable. The following statement of it is for several factors in terms of average outputs.

As increasing inputs of one or more elements of production are added to one or more fixed elements, a point is soon reached after which outputs per unit of the varying input elements decrease; and if more than two of either fixed or varying elements are involved, the points at which the decrease sets in, and the amount of all the outputs per unit of input, are affected by the inter-effects of the changes in the several varying elements, and also by the inter-effects between the several fixed and the several varying elements.

It is also proper to state a *Principle of Increasing Physical Inputs.* Stated in terms of two elements, it is of course a mere counterpart of the Principle of Diminishing Physical Outputs if this principle is made to include both average and total outputs. So stated, it would

run as follows: As increasing inputs of any element of production are added to a fixed element, a point is soon reached after which the inputs of the varying element per unit of output increase; the inputs of the fixed element per unit of output, however, decrease as long as a larger physical output is possible.

A statement of it in terms of several elements would be as follows: *As increasing inputs of one or more elements of production are added to one or more fixed elements, a point is soon reached after which the inputs of the varying elements per unit of output increase: the inputs of the fixed elements per unit of output, however, decrease as long as a larger physical output is possible. If more than two of either of the fixed or the varying elements are involved, the points at which increasing inputs per unit of output begin, and the amounts of these inputs, are affected by the inter-effects of the changes in the several varying elements, and also by the inter-effects between the several fixed and the several varying elements.*

SUGGESTIONS FOR FURTHER READING

F. M. Taylor's *Principle of Economics* (1921), Chapters IX and X, particularly pp. 124–134, presents an excellent discussion of the subject matter of this chapter. The reader is also referred to H. C. Taylor's *Outlines of Agricultural Economics* (1925), pp. 153–158. One of the best treatments is in Chapter II of T. N. Carver's *Distribution of Wealth* (1908). P. H. Wicksteed's *Common Sense of Political Economy* (1910), Book II, Chapter V, contains an exhaustive but rather difficult discussion of the subject.

An application of the principles explained in this chapter to the analysis of farming enterprises is contained in United States Department of Agriculture Bulletin 1277 (1924), *Input as Related to Output in Farm Organization and Cost of Production Studies* by H. R. Tolley, J. D. Black, and M. J. B. Ezekiel.

PROBLEMS

1. Show that the principle of diminishing physical outputs applies to at least three cases not mentioned in the text.
2. Assume numbers for one of these cases or one in the text not illustrated by numbers and construct a diagram showing total, average, and additional outputs.
3. When Malthus used the principle of diminishing returns in his theory of population, was he interested primarily in diminishing additional, average or total returns? Why?
4. F. M. Taylor calls the principle of diminishing physical outputs "the principle of the three stages."
   a. Show that such a name can be applied.
   b. May there be four stages?

5. If you had 150 pecks of barley and 12 acres of land, and combining seed and land in the same proportions as in the illustration in the text gave results in exactly the same proportion as in the illustration, would you plant all of the seed on the 12 acres? Give reasons for your answer.
6. If in the above problem, you had the same amount of seed, but 30 acres of land instead of 12, would you plant all of the seed on the 30 acres? Explain.
7. How did the principle of diminishing outputs affect the size of farms in prairie regions when land was free?
8. Under conditions of free land, in which of the three curves is a farmer most interested? Explain.
9. The additional outputs of power accompanying successive equal additional portions of fuel fed to one engine are as follows: 2, 7, 10, 9, 7, 5, 3, 1, — 1, — 3. Construct a diagram showing curves of additional outputs, total outputs and average outputs per unit of input. Indicate the three sets of outputs at the bottom of the diagram. Locate the points of diminishing additional, total and average outputs.
10. Define points T, M and A of above problem in terms of fuel, power and engine.
11. When from 1 to 8 doses of potash fertilizer were applied to a fixed amount of land in the growing of potatoes, the accompanying total outputs were as follows: 2000, 6000, 12,000, 18,000, 21,000, 22,800, 22,400, 20,000. Construct a diagram showing additional, total and average output curves. Locate points T, M and A.
12. When from 1 to 8 doses of the same land were applied to 8 units of the same potash, the accompanying total outputs were as follows: 6000, 14,000, 18,000, 20,000, 21,000, 21,100, 20,200, 19,200. Construct a diagram showing additional, total and average output curves. Locate points T, M and A.
13. a. What part of the diagram in No. 11 above represents too much potash per unit of land? What part of the diagram in No. 12 above? b. What part of the same two diagrams represents too little potash per unit of land?
14. People who know of the principle of diminishing outputs only in popular terms often state it as applied to unsuccessful farmers by using the expression "Farmer So and So is land-poor," meaning that he would be better off if he had less land. Show clearly what they mean by using the terms applied in this chapter. Show which factor is fixed and which is varying and which curve is referred to.
15. Assume that the total yields on the ten farms in the illustration in the text were respectively 132, 270, 400, 490, 522, 500, 440, 354, 238 and 118. Construct a diagram showing total, average, and additional outputs.
16. In 12 different establishments using the same types and sizes of machines and turning out the same product, the following numbers of men and machines were in use, with daily outputs as indicated in the third column:

	Machines	*Men*	*Output*		*Machines*	*Men*	*Output*
I	80	424	2700	VII	56	476	4452
II	2	10	50	VIII	40	356	3180
III	14	98	980	IX	36	216	1818
IV	80	720	5980	X	42	310	3154
V	120	960	9420	XI	20	130	1300
VI	16	90	690	XII	10	62	588

a. Reduce to ratios of men to machines.
b. Arrange in order from lowest to highest number of men per machine.
c. Compute output per machine for each establishment.
d. Assume one machine as fixed, and labor added. Use data computed in a, b and c, and construct curves of average outputs per man, total outputs, and additional outputs.
e. Locate points T, M and A and define them.
(Save your data; they will be used in a problem in next chapter.)

17. Each unit of equipment in a certain factory occupies 500 square feet of floor space, and the plant has 10 units. The output when 100 men are employed is 8000 per day, and the total outputs accompanying each additional man per unit up to 20 are as follows: 11,000, 15,000, 18,000, 20,000, 21,000, 21,600, 21,700, 21,600, 20,700, 19,000.
a. Construct curve for outputs per unit of equipment as labor is added.
b. Same for building space.
c. Same for labor.
18. As the volume of business of a certain company expanded, it kept adding more and more units of equipment to its plant, starting with 5 and ending with 15; and every time it added a new unit of equipment, it added exactly 100 men to work with it. The output with 5 units and 500 men was 2500. The sixth unit added 600 to the output, the seventh, 700, and the others respectively as follows: 800, 700, 600, 500, 400, 300, 200, 100.
a. Construct curves of total and additional outputs.
b. Construct a curve of output per unit of equipment and 100 men.
c. Locate points T, M and A and define each.
19. Does the principle of diminishing physical outputs act as an incentive or as a check on further specialization?
20. How is the principle of diminishing physical outputs a factor affecting comparative advantage?
21. From the following table of total outputs as various amounts of seed and fertilizer are applied to land, it is possible to construct 26 diagrams of diminishing outputs; 23 with two fixed factors and one varying; 1 with one fixed factor and one varying; 1 with one fixed and two varying together; and 1 with one fixed and two varying inversely. The instructor will assign each student a separate problem. (Save your data, as you will need them in the problems of the next chapter.)

INPUTS OF SEED

INPUTS OF FERTILIZER	4	5	6	7	8	9	10	11	12	13	14	15
0	10	34	49	57	63	68	71	73	74	75	72	65
1	19	41	57	70	79	86	91	94	96	97	96	87
2	25	48	65	82	95	103	109	114	117	119	120	108
3	30	55	74	93	108	120	127	133	137	140	141	127
4	33	60	83	103	119	133	142	150	155	158	160	143
5	36	65	90	112	129	145	157	165	171	176	178	157
6	38	70	96	119	138	155	168	179	185	188	189	168
7	39	75	101	125	144	162	175	188	196	198	196	175
8	40	79	106	130	149	166	181	195	204	207	198	173
9	38	78	108	133	154	170	185	197	207	210	193	166
10	34	70	103	132	158	173	186	189	190	185	175	159
11	25	54	80	104	125	143	156	165	164	161	156	150

22. In the table of Problem 21, there are 144 combinations of the 3 factors. If you had a third variable, say labor, which could be varied independently from 5 to 15 units, how many combinations would there be?
23. If this were irrigated land so that water could also be varied independently from 8 to 16 inches, making a fourth variable, how many combinations would there be?
24. Why in actual practice or in experimental work is it unnecessary to try out so many combinations?

CHAPTER XII

THE PRINCIPLE OF DIMINISHING AND INCREASING ECONOMIC INPUTS

In the preceding chapter, we analyzed the combination of the elements of production as a purely physical phenomenon. For two reasons, this is not adequate. One is that it gives us inputs of a number of different elements with no way of combining them. Thus there is no way of adding the use of a machine for 32 minutes, the 32 minutes of man-labor, the 640 horsepower-minutes, and the 115 bushels of wheat used in producing 25 barrels of flour. It is all very well to compare efficiency of different plants or machines in the utilization of labor, or power, or raw materials; but as already pointed out, labor, power and raw materials are often partly substitutes for each other—that is, the more that is used of one, the less that is needed of the others;—and the efficiency in the utilization of one may be at the expense of efficiency in the utilization of the others. Under these circumstances, one must have some way of combining these efficiencies in order to get the whole effect.

The other defect of the physical input data is that in themselves they include none of the effect of fluctuating prices. It will be conceded without argument that the relative amounts of the different elements of production to use depends somewhat upon their relative prices. In a period when wages are high and machinery cheap, manufacturers use less labor if possible and substitute machinery for it at every turn; but if the reverse is true, labor would tend to take the place of machinery on many operations. In regions of the earth where labor is abundant and wages low, as in India, very little machinery is used, and what is used is often driven by human power; for example, water for irrigating the fields is sometimes raised from streams by man-driven elevators. When feed is high, dairymen feed lighter rations to their cows; and a change in the relative prices of different feeds causes them, if they are intelligent dairymen, to re-balance their rations. If department stores had to pay twice present wages for their saleswomen, they would employ appreciably fewer of them. If advertising rates were lowered, merchants and manufacturers would do more

advertising. The higher the frontage cost of store sites, the less frontage is used. One ingenious journalist has even argued that the modern styles of dancing had their origin in the days of the housing shortage and high rents immediately following the war.

Obviously, therefore, before our analysis is complete, some way must be found of adjusting the data of physical inputs and outputs to changing prices. Physical input data must be converted to price input data. To do this is the first objective in this chapter. It will be at once apparent that when the physical inputs are all converted to a price basis, *they can be combined into one input figure.* If the price of 32 minutes' use of a machine is $.64; of 32 minutes of labor, $.56; of 640 horsepower-minutes, $1.20; and of 115 bushels of wheat $140.00; and the output is 25 barrels of flour; then the input per barrel of flour is $142.40 divided by 25, or $5.65. Thus the one operation of converting input data to a price basis overcomes the two shortcomings of the physical input data.

Cost of Production.—Inputs expressed in price or value terms are popularly called *costs*, or *costs of production.* It is the customary thing in the business world to add the various costs together, the costs of raw materials, labor, power, supplies, depreciation and upkeep upon plant and equipment, and divide the total by the output and call the result the "unit cost of production." Thus steel manufacturers speak of their costs of producing a ton of steel, millers of their costs of producing a barrel of flour, farmers of their costs of producing 100 pounds of milk, merchants of their costs per dollar of sales, and railroad operators of their costs per ton-mile of freight hauled.

Now costs of production are very significant in the business world. The profits of a business are the difference between expenses and receipts, and costs of production are simply expenses reduced to a unit basis. We can therefore afford to analyze costs very carefully, see how they vary and discover all the reasons for their variations.

Frequently all the analyzing of costs that business men do is to divide their annual expenditures by their annual output and thus obtain an average annual cost figure. They compute these each year, and see how their unit costs one year compare with those of the years preceding, or with those of their competitors if they know them, and then speculate as to the reasons for the differences.

The more interested of them, however, are not satisfied merely to speculate, but proceed to analyze more closely. The first thing which they discover about differences or changes in costs when they do this

is that they are likely to be due to either of two sorts of causes, namely, difference in prices or "cost-rates" paid for the cost elements, and differences in the physical inputs. In some years, they are able to buy raw materials, supplies, labor, etc., more cheaply than in others, and this reduces the costs. In some years they are able to utilize raw materials, supplies, labor, etc., to better advantage than in others, that is, they are able to secure a large output per unit of input and this reduces their costs. Similarly, some entrepreneurs buy more cheaply than others, or utilize their cost elements to better advantage.

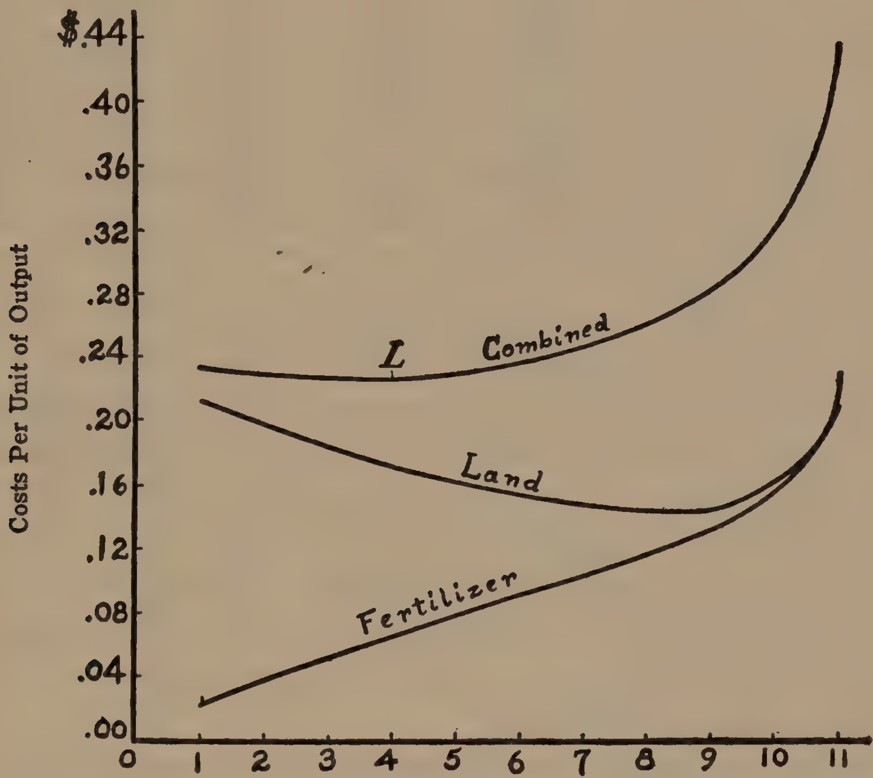
Control of Costs.—The reason that cost-rates fluctuate, of course, is that the market prices fluctuate. In general, the same sorts of influences that cause the price of flour to fluctuate also cause the price of wheat to fluctuate, and the price of labor and supplies to fluctuate. Movements in the prices of commodities and cost elements are the stock-in-trade of business and economics. The reasons for these movements are explained in other courses in economics. They are so much to be expected that conditions are considered abnormal if they do not occur.

The reason that cost-rates differ between entrepreneurs is either that the different entrepreneurs buy at different times, with prices at different levels at the time they buy; or that some are able to buy more intelligently or bargain more effectively than others. Even choosing when to go into the market to buy may be a matter of understanding and foresight. Some entrepreneurs are able to buy more cheaply because they buy in large quantities.

The reason that physical inputs vary from year to year or between plants is that the combinations of the cost elements vary. Some use a larger proportion of raw materials or labor or power or supplies than others. The analysis in the last chapter has shown how physical outputs per unit of input, and hence inputs per unit of output, vary as the proportion between the cost-elements vary. Some manage to combine their cost elements in such a way as to secure a low input of one element, some so as to secure a low input of another. Some manage so that most of the important elements have relatively low inputs; others so that most of them are high.

Reducing costs therefore includes on the one hand buying intelligently and effectively and at favorable turns of the market, and on the other hand, combining the elements of production in such a way as to obtain low inputs per unit of output. The former of these method will be discussed in other courses in economics.

The Least-Cost Combination.—The phase of control of costs to which entrepreneurs have given least attention is probably the combination of the production elements. At least, there are relatively few of them who have the data as to the relation between inputs and outputs in such form that they can make ready and effective use of them. The form in which the data are needed for such a purpose is the form in which they are presented in the preceding chapter—in the form of curves of inputs per unit of output. This is illustrated in



Inputs of Fertilizer
Land, $10 per acre; fertilizer, $1 per hundredweight

FIG. XV. Least-Cost Combination with One Fixed and One Varying Input.

Table XI and Figure XV. The first five columns in Table XI present data of the sort with which we are already familiar. In the last three columns, a cost-rate of $10 per acre is applied to the land inputs, and of $1 per hundredweight to the fertilizer; and the two products are added to give the total cost per unit of output in the last column. Figure XV presents the two cost curves for land and fertilizer inputs and also the curve of combined costs per unit of output. The low point L for the combined curve is neither at the low point for fertilizer cost, which is at 1 hundredweight, nor at the low point for land, which is at 9 hundredweights of fertilizer, but about halfway between.

TABLE XI. LEAST-COST COMBINATION WITH LAND AND FERTILIZER [1]

Inputs		Total outputs	Inputs per unit of output		Cost per unit of output		
Land	*Fertilizer*		*Land*	*Fertilizer*	*Land*	*Fertilizer*	*Both*
1	1	47	.0213	.0213	.213	.0213	.2343
1	2	51	.0196	.0392	.196	.0392	.2352
1	3	56	.0178	.0536	.178	.0536	.2316
1	4	62	.0161	.0645	.161	.0645	*.2252*
1	5	64	.0156	.0781	.156	.0781	.2341
1	6	67	.0149	.0895	.149	.0895	.2385
1	7	68	.0147	.1030	.147	.1030	.2500
1	8	69	.0145	.1159	.145	.1159	.2609
1	9	70	.0143	.1287	.143	.1287	.2717
1	10	64	.0161	.1562	.161	.1562	.3172
1	11	48	.0208	.2294	.208	.2294	.4374

Fertilizer costs increase from the first unit on, but land costs decrease. The sum of the two is least at 4 hundredweights of fertilizer. This point is to be known hereafter as the point of the *least-cost combination.*

Given two elements of production, one fixed and one varying, and two curves of inputs, one for the fixed element and one for the varying element, it is always possible to locate the point of the least-cost combination by the process just described of applying cost-rates to the inputs and adding the two products. The point of least-cost combination will always come somewhere between the points of lowest inputs for the two cost elements.

A table such as the above does not of course locate the least-cost point exactly. It merely indicates within which fertilizer application it lies. In the present case, for example, it indicates that it is somewhere within the 4th application. The exact point could be located only by splitting the 4th application into a large number of small parts and applying them one at a time. Something approximating this point can, however, be approximated by arithemetical means. For example, in this case it is clear that the point lies a little nearer to 3 applications than to 5 because the cost with 4 applications is only 0.0064 away from the cost with 3 fertilizer inputs, as compared with 0.0089 away from the cost with 5 fertilizer inputs.

The range between the highest and lowest costs in Table XI is over $.20, or nearly a hundred per cent. This range is all produced by

[1] Land, $10 per acre; fertilizer, $1 per hnndredweight.

variations in inputs, due to variations in combinations of the elements. The cost-rates are the same throughout. Most producers will of course be found operating somewhere within three or four inputs of the least-cost point; but there are usually some who are far astray from it.

The effect of different cost-rates upon the location of the least-cost point should be easily apparent. Raising the cost-rate for land will

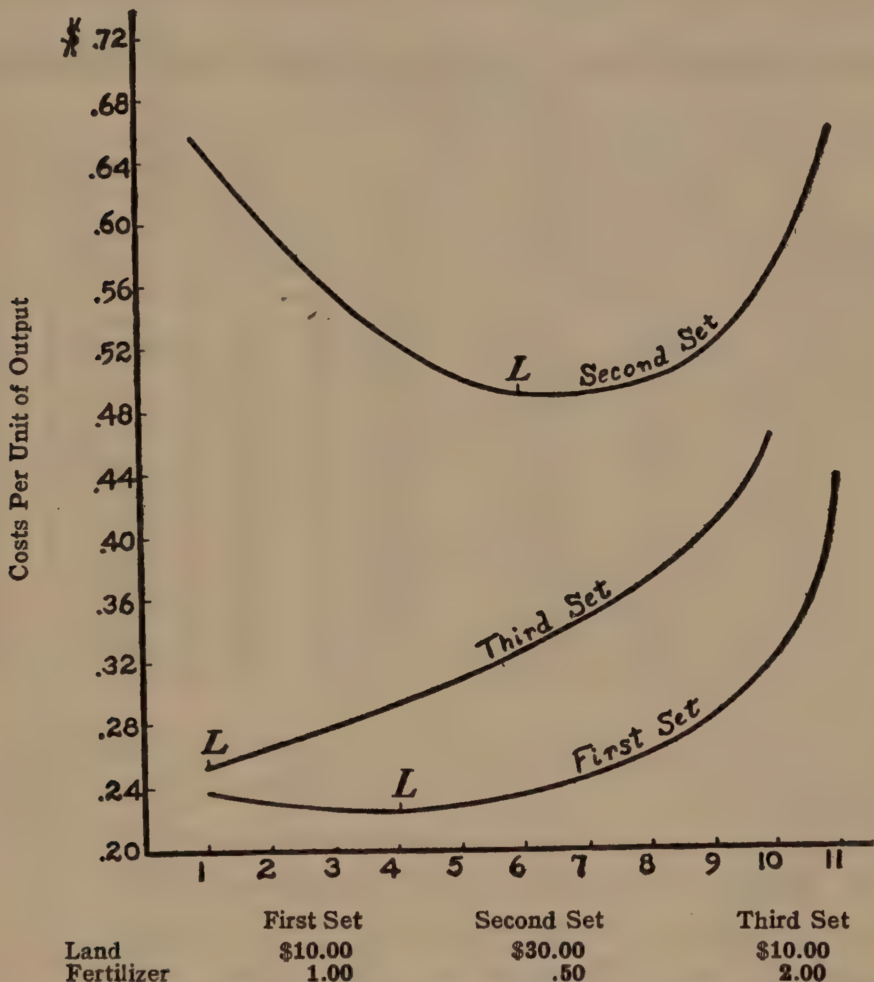


FIG. XVI. Least-Cost Combination with Three Different Sets of Cost-Rates.

push the least-cost point to the right in the diagram; since the higher cost-rate is multiplied into the inputs, it adds more absolute cents to the costs of the higher land inputs than to the costs of the lower land inputs. It will therefore add less to the total cost nearer the low point for land inputs. Similarly, raising the cost-rate for fertilizer will move it in the opposite direction. *Raising the cost-rate of any input element causes it to be economized—that is, the least-cost point will be moved so that less of this input element will be used in the combination.*

This means that the least-cost point will be moved toward its point of smallest input. This is illustrated in Table XII and Figure XVI, in which to the same physical inputs as in Table XI are applied two additional sets of cost-rates, the second set of cost-rates increasing the land cost and decreasing the fertilizer cost, and in consequence moving the least-cost point from the 4th to the 6th fertilizer input; and the third set of cost-rates raising fertilizer rates, and in consequence moving the least-cost point back from the 4th to the 1st fertilizer input.

TABLE XII. LEAST-COST COMBINATION WITH DIFFERENT COST-RATES

Inputs of fertilizer	SECOND SET OF COST-RATES			THIRD SET OF COST-RATES		
	Land at $30	*Fertilizer at $.50*	*Combined*	*Land at $10*	*Fertilizer at $2*	*Combined*
1	.639	.0106	.6496	.213	.0426	*.2556*
2	.588	.0196	.6076	.196	.0784	.2744
3	.534	.0268	.5608	.178	.1072	.2852
4	.483	.0322	.5152	.161	.1290	.2900
5	.468	.0390	.5070	.156	.1562	.3122
6	.447	.0447	*.4917*	.149	.1790	.3280
7	.441	.0515	.4925	.147	.2060	.3530
8	.435	.0579	.4929	.145	.2318	.3768
9	.429	.0643	.4933	.143	.2574	.4004
10	.483	.0781	.5661	.161	.3124	.4734
11	.624	.1147	.7387	.208	.4588	.6668

If to the data of Figure VII in Chapter XI relating to barley seed and land in combination, a cost-rate of $.50 a peck is applied to the seed, and of $1 per acre to the land, the least-cost point will be $.118 in the 7th input, as indicated in Table XIII. If the cost-rates for land were doubled, the least-cost would be $.143 in the 8th input. If it were quadrupled, the least-cost would be $.192, almost in the 9th input. But this amount of shift would not result from raising the cost-rates for land if the cost-rates of barley seed were not exaggerated—20 cents a peck is more nearly a normal price for barley seed than 50 cents. Barley seed is so small a part of the cost of producing barley that a change in the cost-rate for seed from 15 to 30 cents a peck would have changed the least-cost point for seed and land so little that the shift would not have been discernible in tables such as here used. This illustrates the important point that *changes in the cost-rates of the major cost-elements will affect the location of the least-cost point much more than changes in cost-rates of the lesser cost elements.*

TABLE XIII. LEAST-COST COMBINATION—SEED AND LAND [1]

	I	II	III	IV	V
Inputs seed	INPUTS PER UNIT OF OUTPUT		COST PER UNIT OF OUTPUT		*Both*
	Seed	*Land*	*Seed*	*Land*	
1	.500	.500	.250	.500	.750
2	.333	.167	.166+	.167	.333
3	.250	.083	.125	.083	.208
4	.200	.050	.100	.050	.150
5	.185	.037	.092+	.037	.129
6	.182	.031	.091	.031	.122
7	.184	.026	.092	.026	*.118*
8	.191	.024	.095+	.024	.119+
9	.205	.023	.102+	.023—	.125
10	.227	.023	.113	.023—	.136
11	.256	.023	.128	.023+	.151
12	.296	.024	.147+	.024	.171

The Principle of Decreasing and Increasing Economic Inputs.—We are now ready to state in economic terms what happens as inputs are increased. The principle is as follows: *When increasing inputs of an element of production are added to a fixed element, the combined inputs measured in terms of cost at first decrease and then increase, the location of the point of least combined cost depending upon the cost-rates and the relative importance of the two elements.*

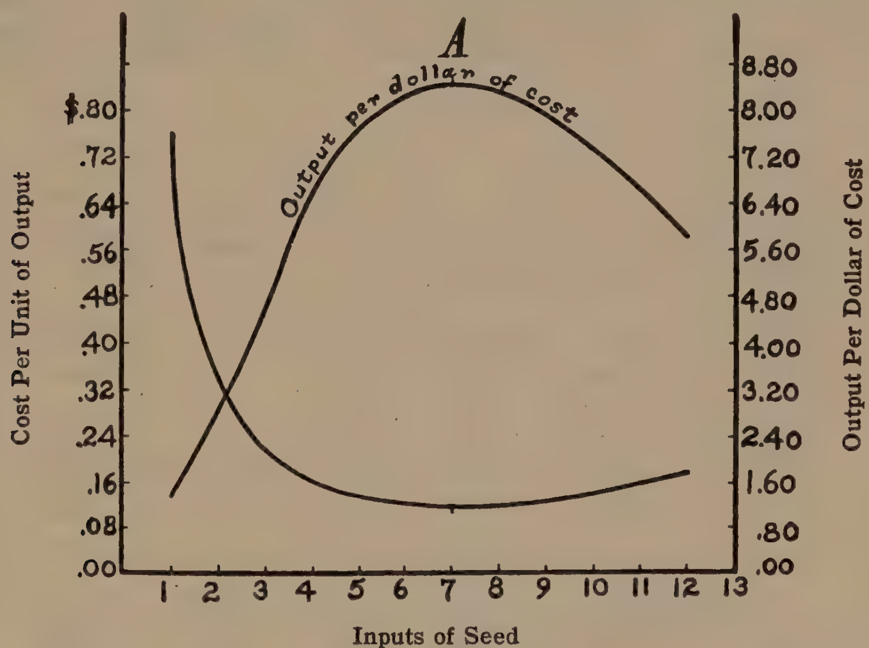


FIG. XVII. Output per Dollar of Cost Compared with Cost per Unit of Output.

[1] Land at $1 per acre; seed at $.50 a peck.

This principle is called the *Principle of Decreasing and Increasing Economic Inputs* (*or sometimes Costs*). It is sometimes designated as the economic counterpart of the Principle of Diminishing Physical Outputs. This is far from the truth. There is no curve that can be drawn that is the physical counterpart of the economic input curve, for the simple reason that no one physical curve can include the curves for both the fixed and the varying elements. The two curves of physical inputs must be drawn separately.

There is, however, a curve in terms of economic units which in a sense is a counterpart of the Principle of Decreasing and Increasing Economic Inputs. This curve represents output per unit of combined economic input—in ordinary language, output per dollar of cost. In Figure XVII, the curve with its high point at A is such a curve. It is based upon Column VIII of Table XIV, which is obtained by dividing the total outputs by the total costs of each input combination. Thus the 1.33 units of output per dollar of input is obtained by dividing the output of 2 by the $1.50 of cost for that combination.

TABLE XIV. OUTPUT PER UNIT OF COST—THE CURVE OF INCREASING AND DIMINISHING ECONOMIC OUTPUT

I	II	III	IV	V	VI	VII	VIII
Input of seed	*Input of land*	COSTS		*Total input costs*	*Total output*	*Cost per unit of output*	*Output per dollar of input*
		Seed	*Land*				
1	1	$ .50	$1.00	$1.50	2	$.750	1.33
2	1	1.00	1.00	2.00	6	.333	3.00
3	1	1.50	1.00	2.50	12	.208	4.80
4	1	2.00	1.00	3.00	20	.150	6.67
5	1	2.50	1.00	3.50	27	.129	7.71
6	1	3.00	1.00	4.00	33	.122	8.25
7	1	3.50	1.00	4.50	38	*.118*	*8.44*
8	1	4.00	1.00	5.00	42	.119	8.40
9	1	4.50	1.00	5.50	44	.125	8.00
10	1	5.00	1.00	6.00	44	.136	7.29
11	1	5.50	1.00	6.50	43	.151	6.62
12	1	6.00	1.00	7.00	41	.171	5.86

The costs in Columns III and IV are obtained by multiplying the total inputs of Columns I and II by the cost-rates, $.50 in the case of seed, and $1.00 in the case of land. The highest output per dollar of input is 8.44 at the same input as the least-cost combination in

Column VII. This diagram makes it clear that these two curves are simply reciprocals of each other.[1]

The Method of Total Outputs *vs.* Total Costs.—Table XIV also suggests another way of calculating unit costs and determining the least-cost combination, namely, by applying the cost-rates to the total inputs, adding the products, and dividing by the total outputs. Thus one might compute the cost of producing a barrel of flour by applying wage rates to the labor used in a day or month or year, power rates to the power used, machine rates to the equipment used, etc., then adding the products and dividing by the total number of barrels of flour milled during the period. The difference between this method and the one explained above is merely a difference in arithmetic. The results are the same. If one's data were in the form of total inputs and total outputs, this would be the more direct way of figuring. With the data on a unit basis, however, the more direct method is the one first presented of applying cost-rates to the per-unit inputs and adding the products. The unit method has the great advantage of giving one a clearer vision of the way in which changing cost-rates shift the least-cost combination.

The student should be able to think readily in terms of either method of figuring, because production data are constantly being presented in both forms. At one time a manufacturer may be thinking in terms of what it costs to manufacture a unit of product and will proceed by combining the labor costs, power costs and materials costs used in each unit of product. At another time he may be thinking of his factory output as compared with his total costs. In general, there is more calculating done on the first basis than upon the second. It fits in much more closely with the cost-accounting method.

Least-Cost Combination with Two Fixed Elements and One Varying Element.—Figure XI showed inputs per unit of output

[1] Economists sometimes present the so-called "Economic Law of Diminishing Returns" by holding one element, such as land, fixed and varying several other elements, such as seed, labor and fertilizer, more or less at the same time; by reducing these to a dollar basis, they are able to combine them into one input figure. They are thus able to show a curve of total outputs increasing with costs (other than land) up to a certain point, and then decreasing. They could also show on this basis a curve of average outputs per dollar of cost (not including land cost), and a curve of additional outputs accompanying additional dollar inputs (omitting land inputs). These could be converted into curves and combined cost inputs for all costs except land. The least-cost combination on such a cost curve would be a least-cost combination for all elements other than land. Such a presentation would represent a confusing of the physical and economic bases of the principle involved, but would have its uses at times.

TABLE XV. LEAST-COST COMBINATION WITH THREE SETS OF COST-RATES, FOR TWO FIXED ELEMENTS AND ONE VARYING ELEMENT

				INPUTS PER UNIT OF OUTPUT			FIRST SET OF COST-RATES, UNIT COSTS WITH—				SECOND SET	THIRD SET
Men per machine	*No. of machines*	*No. of men*	*Total output*	*Building*	*Machines*	*Men*	*Buildings at $20*	*Machines at $10*	*Men at $5*	*Combined*	*Combined cost, Building @ $20 Machines @ $10 Men @ $2.50*	*Combined cost, Building @ $40 Machines @ $20 Men @ $1*
2	4	8	20	.0500	.2000	.4000	$1.000	$2.000	$2.000	$5.000	$4.000	$6.400
3	4	12	48	.0208	.0833	.2500	.416	.833	1.250	2.499	1.924	2.748
4	4	16	80	.0125	.0500	.2000	.250	.500	1.000	1.750	1.250	1.700
5	4	20	108	.0093	.0370	.1852	.186	.370	.927	1.483	1.025	1.297
6	4	24	128	.0078	.0312	.1887	.156	.312	.943	*1.111*	.945	1.124
7	4	28	140	.0071	.0286	.2000	.142	.286	1.000	1.428	*.928*	1.056
8	4	32	144	.0069	.0277	.2222	.138	.277	1.111	1.526	.970	*1.052*
9	4	36	144	.0069	.0277	.2500	.138	.277	1.250	1.665	1.040	1.080
10	4	40	140	.0078	.0286	.2857	.156	.286	1.428	1.870	1.156	1.170

with two fixed elements, land and fertilizer, and one varying element, seed. The low-input points for land and fertilizer are one above the other on the diagram and at some distance to the right of the low-input point for the seed curve. To determine the least-cost combination under such circumstances merely requires multiplying three sets of physical inputs by their respective cost-rates, adding the products and observing which combination gives the least total. Obviously it will come nearer the low-input point for land and fertilizer than the low-input point for seed, since land and fertilizer together make a larger proportion of the total cost; and its exact location will depend upon the relative cost-rates for the three elements.

Table XV shows the shifting of the least-cost combination with three sets of cost-rates when the building and number of machines are fixed and the number of men is varying. The inputs used are derived from the curve for 4 machines in Figure X in the preceding chapter. At the first set of cost-rates, 6 men per machine produce at least-cost; at the second set, 7 men per machine; and at the third set, 8 men per machine. Lowering the cost-rates for the two fixed elements relative to the cost-rates for labor would have the opposite effect. If the cost-rates for labor were raised to \$10, building and machine rates being as in the first set, the least-cost combination would come at 5 men per machine.

Least-Cost Combination with one Fixed Element and two Varying Elements.—If 8 machines were held fixed instead of 4 in the foregoing illustration, the least-cost would be \$1.330 with the first set of cost-rates in place of \$1.111. At these cost-rates, 8 machines and 6½ men per machine produce at lower cost than 4 machines and 6 men per machine, the least-cost combination in the former case. Yet neither of these may give the least possible cost. Perhaps more machines and more men per machine than the former, or less machines and less men per machine than the latter, or some number in between, or more machines and less men, or vice versa, will give a lower unit cost with these cost-rates, than even the \$1.330. That combination which gives least cost can only be discovered by trying out all the combinations within reason with these sets of cost-rates. This is done in Figure XVIII, in which cost-rates are applied to the data of Figure XIV in the last chapter. The least-cost is found to come with 6 units of fertilizer and 11 units of seed. Either more or less seed or more or less fertilizer would raise the cost. The cost-rates used are: land, \$10; fertilizer, \$1; seed, \$1. This \$.386 of cost in the least-

cost combination is comprised as follows: land, \$.143; fertilizer, \$.086; seed, \$.157. The curve RR′ shows how, with these cost-rates, the amount of seed that would give least-cost would vary if one were to vary the fertilizer from 0 to 11; and the curve SS′ how the amount

Inputs of Fertilizer	2	3	4	5	6	7	8	9	10	11	12	13	14	15
11	\$-----	\$-----	\$4.165	\$1.529	\$1.040	\$ .824	\$ .725	\$ .667	\$ .645	.640	\$ .647	\$ .680	\$ .729	\$ .818
10	-----	11.500	2.666	1.250	.813	.659	.549	.491	.462	.437	.432	.439	.479	.584
9	21.000	5.500	2.091	1.091	.735	.565	.473	.432	.415	.400	.397	.405	.459	.558
8	20.000	4.200	1.692	.958	.648	.510	.456	.416	.406	.392	.390	.398	.451	.559
7	9.500	3.332	1.500	.880	.605	.500	.447	.413	.397	.389	.392	.395	.456	.572
6	9.000	2.714	1.333	.764	.579	.490	.437	.403	.388	.386	.394	.397	.469	.595
5	5.667	2.250	1.117	.715	.553	.468	.426	.400	.390	.388	.398	.412	.492	.639
4	4.000	1.888	.999	.679	.540	.467	.423	.403	.394	.398	.413	.443	.521	.690
3	3.750	1.600	.895	.643	.527	.465	.428	.423	.412	.421	.448	.482	.575	.778
2	2.800	1.364	.800	.607	.515	.475	.444	.438	.432	.442	.470	.532	.650	1.040
1	2.165	1.166	.750	.592	.515	.473	.453	.444	.447	.468	.511	.600	.757	1.443
0	2.000	1.083	.700	.555	.485	.447	.428	.437	.454	.488	.550	.676	1.002	2.083

Inputs of Seed

Land at...... \$10.00
Fertilizer at.. 1.00
Seed at....... 1.00

FIG. XVIII. Least-Cost Combination with One Fixed Factor and Two Varying Elements.

of fertilizer that would give least cost would vary if one were to vary the amount of seed from 2 to 15.

If the cost-rates were those of Set No. 2, Figure XIX, the least-cost combination would come at 8 units of fertilizer and 12 of seed; if they were those of Set No. 3, the combination would come at 6 units of fertilizer and 10 of seed. Thus as before, a rise in the cost-rate for any element causes the least-cost point to move toward its low-input point so as to economize the use of it. If the price of seed is doubled, and the cost-rates of the others remain the same, or rise less, the least-cost moves so that less seed is used. The amount which the least-

cost will be moved with two varying elements is likely to be different from what it would move with only one varying element, for the reason that there is the influence of the cost-rate of another varying element to be taken into account. This influence may pull in the same direction and augment the shift, or in an opposite direction and reduce it.

Set No. 2 (Inputs of Fertilizer by Inputs of Seed)

Inputs of Fertilizer	8	9	10	11	12	13	14
11							
10				.578	.567		
9			.558	.533	.525	.531	
8		.571	.551	.527	.520	.526	.592
7		.572	.544	.528	.527	.527	.603
6		.564	.537	.529	.535	.534	.625
5			.546	.537	.544	.559	
4				.557	.573		
3							
2							
1							
0							

Inputs of Seed

Set No. 2

Land at...... $20.00
Fertilizer at.. 1.00
Seed at........ 1.00

Set No. 3 (Inputs of Fertilizer by Inputs of Seed)

Inputs of Fertilizer	8	9	10	11	12	13	14
11							
10				.592			
9			.558	.547	.551		
8		.554	.551	.541	.546	.565	
7		.556	.544	.542	.554	.566	
6	.582	.548	.537	.543	.563		
5		.550	.546	.552			
4			.558				
3							
2							
1							
0							

Inputs of Seed

Set No. 3

Land at...... $10.00
Fertilizer at.. 1.00
Seed at........ 2.00

FIG. XIX. Least-Cost Combination as in Fig. XVIII, but with Two Different Sets of Cost-Rates.

Thus lowering the cost-rates for land from $20 to $10 as between Sets No. 2 and No. 3 shifts the least-cost point less to the right than it would have if the cost-rates for seed were not raised from $1 to $2 at the same time. With only two elements involved, moving toward the least input for one, means moving away from the least input for the other. With a third element involved, it may mean in addition moving either toward or away from the least input for a third.

The tendency of the least-cost point to move toward the low point for one input because of a rise in its cost-rate may meet a counter-effect arising from a change in cost-rate for the third element, which

may partly or wholly offset it. The effect of changing cost-rates on the location of the least-cost point is therefore somewhat more difficult to predict with three elements in combination than with two.

It should be realized that it is relative and not absolute change in cost-rates that is significant in determining the location of the least-cost point. If the cost-rates of all the elements doubled together, the location of the least-cost point would not be changed in the slightest. But if the cost-rate for one rises or falls while the cost-rates for the others remain constant, then the location of the least-cost point is sure to be affected. If all rise or fall, but unequally, then the least-cost point will be moved. This last circumstance is a very common one in the business world. General changes in the price level frequently raise or lower the prices of all the cost-elements, but unequally —wages, for example, may lag behind other cost-rates.

If there were four elements in place of two, there would be four cost-rates possibly changing, and the direction of change in the cost-rate for any one would influence the shift in the location of the least-cost point. If the elements were all fixed but one, the shift would really be between only two low-input points, one for the three fixed elements and one for the varying elements. But if three were varying and one fixed, then there would be four low-input points for the least-cost point to migrate between. The fourth element might be power, with its least input at fifteen machines, which might cause the least-cost point to be located somewhere in the eighth combination, rather than in the seventh, especially if its cost-rates were high. Or the least input for power might be in the fifth combination, in which case it might easily cause the sixth combination to show least cost. But whether the least-cost point would shift this much with a change in power rates would depend upon the other input elements, the location of their low-input points, and the amount of the change in their cost-rates. If six elements were involved instead of three, the analysis would be the same, except that there would be more low-input points pulling on the least-cost point. Where as many as six elements are involved, however, as already pointed out, several of them are likely to be more or less fixed elements, or to vary in proportion to the output, so that their inputs are constant, and hence the analysis of the effects of changing cost-rates may not be so difficult after all. Also some cost-elements are of such minor importance that a change in their cost-rates has little effect upon the location of the least-cost point. If the cost of seed in Figures XVIII and XIX above were not magnified,

changes in its cost-rates would have little effect on the location of the least-cost point.

But changing the location of the least-cost point is not the only consideration. Most of production, as we shall see later, is not carried on at, or even really near, the least-cost point. Changes in the cost-rates affect greatly the combined costs of the inputs on either side of the least-cost point as well as at this point. Thus a producer who used 9 units of fertilizer and 10 units of seed regardless of cost-rates, would find his cost $.029 higher than least-cost at the first set of cost-rates, $.038 higher at the second set of cost-rates, and only $.021 higher at the third set of cost-rates.

How least-cost combination often works out in practice is illustrated by Figure XX. Building and equipment are fixed elements, so

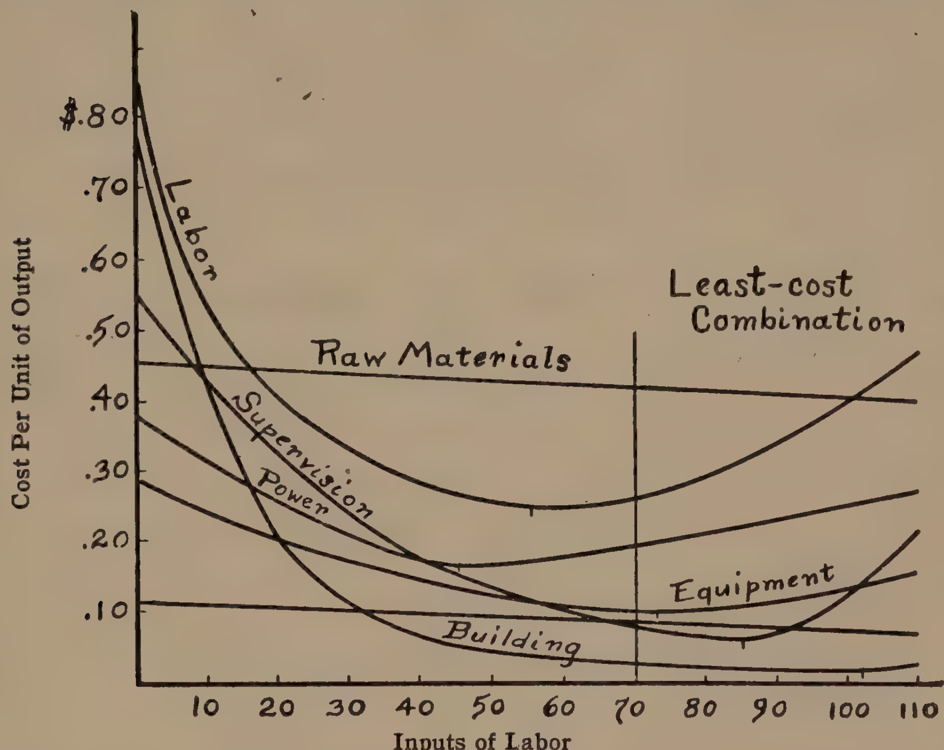


FIG. XX. Least-Cost Combination under Factory Conditions Commonly Prevailing.

that their low-input points come near together. The amount of labor used largely determines the amount of raw materials and supplies that will be used, and hence the amount of power that will be needed. Supervision changes with labor, but not closely so. The same amount of supervision is apparently used with 90 laborers as with 60. Raw materials and supplies are nearly proportional to output—if they were proportional, their costs would be represented by horizontal lines, and would have no effect on the location of the least-cost point.

Given all these circumstances, the least-cost point can be located simply from the data of these curves and a set of cost-rates. In Figure XX, it comes in the combination with 70 units of labor. Cost per unit of supervision, equipment, building, raw materials and supplies are still decreasing at this point; but most of them rather slowly, whereas two important costs, labor and power, are already increasing rather rapidly. The cost per unit of output at this point is $1.17, divided approximately as follows: Raw materials, $.42; Labor, $.25; Power, $.19; Equipment, $.10; Supervision, $.09; Supplies, $.09; Building $.03. The least costs of the several elements range all the way from the 50 combination for power to somewhere outside the diagram for raw materials and supplies.

Of course this is the true least-cost point only under the conditions imposed in this plant. If power or supervision were varied at a different rate, their cost-curves would be different, and the least-cost point would be different. Only by having a complete set of data of inputs for all reasonably possible combinations of all seven of these elements, can a manufacturer really tell what is his true least-cost combination.

Some Applications of Least-Cost Combination.—Every producing unit of any kind, every factory, farm, warehouse, railroad, bank, store, or household, is an example of combination of elements of production with a least-cost combination varying with the cost-rates or prices of the elements. It is not always easy to measure output as already explained, and likewise input. In many cases, cost-rates are difficult or even impossible to determine. Nevertheless, the principle of combination of the elements and increasing and decreasing output per unit of input is always operative. Whether outputs, inputs and cost-rates can be measured or not is a matter of scientific investigation; it has little bearing on the working of the principle itself. Sunlight does not behave any differently now that its velocity has been measured.

Least-cost combinations work out in an interesting manner in many industries. Let us take, for example, a railway enterprise. The right-of-way is a fixed cost, not increasing in the slightest with more inputs of other elements, except at the terminals and stations where it may be necessary to provide more switching facilities or traffic increases. This means that the cost per unit of output for this item will decrease continually, except at terminals and stations. Eventually, however, a point of total diminishing output is reached, result-

ing from the fact that trying to run too many trains per day over the same line, or too long trains, actually reduces the amount of traffic that can be handled. From this point on, unit costs of right-of-way increase.

The same analysis will apply to the first cost of roadbed, until double-tracking becomes necessary, when unit costs will suddenly rise to a high point again, and then begin to decline. Increasing traffic may increase the cost of upkeep of roadbed somewhat; if so, cost of roadbed per unit of output will decrease somewhat less rapidly than cost of right-of-way.

The rails will wear out more rapidly as traffic increases, probably somewhere near proportionately. The first cost of the rails, however, is a fixed amount, and will decrease per unit of output continually till the point of diminishing total output is reached.

As for rolling stock, the more heavily cars and locomotives are loaded, up to a certain point, the less the unit cost. Cars will depreciate more if heavily loaded, especially the car-wheels, but not proportionately more. The same is true of locomotives. But the fuel and oil cost of locomotives is another consideration. Each locomotive has a certain input combination of fuel and oil which enables it to operate at maximum physical efficiency. Too heavy a load may mean a less efficient use of fuel.

The number of trains run per day does not affect the unit costs of cars and locomotives except as it keeps them busy more or less of the time, which is a very important consideration.

The larger the train, up to a certain point, the lower the cost of labor per unit of output. In general, there is a minimum-sized train crew, and until this is fully utilized, unit labor costs decrease.

The staff of station employees has a minimum also, but it is a rather low minimum, so that this division of labor costs probably decreases per unit rather slowly from the very first.

The cost of the staff in the central office of the company no doubt increases somewhat less rapidly than the volume of business, at least at most points along the curve, so that unit costs decrease somewhat.

As for buildings, more input means even lower unit costs, up to the point where the buildings are so overcrowded that traffic cannot be handled expeditiously.

Taking all the elements involved in operating a railway, costs per unit of output decrease with increase in the inputs of the other elements, until a point is reached where roadbed and stations and

terminals are overworked. Because this is true, it is generally said that railroads are affected with *decreasing costs*. What is meant is that within ordinary reaches of experience, costs per unit of output decrease as inputs increase.

Such statements also assume a definite fixed railway plant with a definite mileage, right-of-way and set of buildings. If these are increasing, then we would say that the *size* of the railway was increasing. There is a definite relationship between size and cost per unit; but that relationship has not yet been introduced into the discussion. What we have been considering thus far is the effect on cost per unit of output of increasing the inputs of the varying elements associated with a definite fixed area of land or building or plant or machine of some kind.

A farm, in contrast with a railway, is usually said to be affected with increasing costs. This is only partly true. As already explained, as more labor is applied to land, a point is soon reached where output per unit of input declines; and it is likely that most land is worked under these conditions. But with increasing inputs, the cost of farm buildings and machinery per unit of output will generally decrease, up to the point where these are overworked. If larger buildings and machines are then substituted, these will presumably give lower costs per unit of output than did the smaller buildings. In conclusion, we may say that within the ordinary range of experience, the farm business is affected with more important increasing than decreasing costs.

The telephone business is also sometimes said to be affected with increasing costs. This represents a confusion of ideas. Given a telephone system of a certain size, the cost per call decreases rapidly with the number of calls. The principal additional costs of more calls is for additional operators at the exchanges.

In general, merchandising establishments are affected with decreasing costs within the ordinary reaches of experience. It is possible, however, to increase the volume of goods handled through one store to the point where the cost per unit of service rendered begins to increase. Perhaps more goods will be sold, but the service that is furnished with them will be relatively less per dollar of costs.

The enterprises which come nearest to having *constant* costs are those in which the only costs involved are for raw materials and supplies, labor, and simple tools. These all increase almost in exact proportion to each other, with the result that costs per unit of output

remain about the same regardless of output. Usually, of course, a building is involved, and this element will probably show slight decreasing costs. Perhaps a cigar factory or tailor shop fits these conditions approximately.

The Significance of the Least-Cost Analysis.—Reducing costs is one of the three possible ways of increasing business profits. The other two are selling one's product at a better price, and increasing one's volume of business to a point where profit per unit of output times output more than makes up for somewhat higher costs. The foregoing analysis has shown one important way of reducing costs, namely, by so combining the elements of production as to obtain as nearly as possible the least-cost combination. This should be an objective of every producer. Since the least-cost combination changes with changing cost-rates, the combinations must be shifted to meet them. This means that each producer should be on the alert to note the effects of changing cost-rates on his unit costs.

But he cannot do this simply by watching for changes in the prices of his cost elements. He must also know something of the relation of physical inputs to outputs. He must know how varying the amount of labor used is going to affect his output, and his inputs per unit of output. Hence he really needs to be supplied with a complete set of the physical input data showing the effects of all reasonable variations in the combinations. Securing such data is one of the developments of the future in the field of production. Some producers already recognize this; more will see this as the years go by.

It should be pointed out with respect to the physical input data that many of them do not ordinarily change. The same labor will turn out the same product from the same machines with the same power in the same factory, whether applied this year or a hundred years hence. The same cost-rates for land, seed, fertilizer, labor and machines produce the same effects. But the physical conditions are in general less subject to change than the economic conditions. Many of them can be controlled absolutely. The physical sciences deal much more largely with constants than does economic science. Little of anything is ever fixed in the economic world. Not only are there short-time fluctuations, but also long-time trends. Economic history comes very far from repeating itself. It may be expensive to develop physical data; but once they are developed, they can frequently be used year after year. The same data can frequently be used in many different plants with only slight modifications. Hence public research

agencies and associations of producers can well coöperate in working out such data.

The problems of production economics, it has been pointed out repeatedly, require a combination of the physical sciences and economic science. The problem of the least-cost combination is a splendid example of this. The physical sciences explain the relation between input and output for any combination of elements; economic science explains certain associated variations in costs. But economic science must start its explanation upon a foundation of basic physical data.

Although differences in combination of cost elements will account for a great deal of difference in cost between different plants or stores or railroads or farms, they by no means explain all of the differences in cost. The full explanation of reasons for variations in cost is reserved for a later chapter.

"Unit Requirements."—Some writers in the field of production economics have fallen into the practice of using the expression "unit requirements" to refer to the inputs of the various production elements used in production processes. Thus they will say that "it requires so many hours of man-labor to produce a hundredweight of milk, or so many pounds of coal to produce a ton of cast iron." The implication of such an expression is that a definite amount of each of the production elements is *necessary* before *a unit of output* can be produced. The analysis in this and the preceding chapter makes abundantly clear the error in such a concept. The amounts of the inputs entering into a unit of product vary with every change in any of the inputs. Different producing units combine the elements of production in greatly varying proportions, and hence have greatly different inputs per unit of output. Every relative change in the cost-rates is properly accompanied by a change in the inputs per unit of output. The expression "unit requirements" is therefore very misleading. More than this, it probably has the danger connected with it that producers may get the impression that these particular inputs are "standard" and that their enterprises are properly organized for all time when they combine their input elements according to them.

The Relation of Output and Prices.—In the analysis thus far, we have taken the prices of the cost elements for granted. We have asked what is the price or cost-rate of land, labor, equipment, power, etc.; and then have combined these in such a way as to obtain lowest cost per unit of output. Now it is obvious that prices or cost-rates

are in turn greatly dependent upon inputs and outputs; for example, that the rent of land is greatly dependent upon its input per unit of output, and the same for wages of labor. If the efficiency of land is increased, other things being the same, then its rent will increase; and the same for labor and wages; also if the price of the product rises, then rents and wages will tend to rise. Hence there is an ever-present interaction between prices of the cost-elements and the proportions in which they are combined. The full explanation of this interaction is the problem of that division of economics which is called Value and Distribution. All that can be done at present is to call attention to this relationship, and point out that *until it is explained, our science of production economics is far from being complete.* That is why this book is called an "introduction to production economics." After the student has been taught the principles of price and value, he must be brought back to production economics to complete the analysis.

The student may well ask that if the principles of price and value are needed to understand production economics fully, why is he not taught these principles first? The answer is that he needs the principles of production economics in order to understand price and value. Hence either one or the other must be taken up first and partly explained as a basis for the other. It has seemed best to the author to choose production economics for this rôle.

Prices of the Product.—The price at which the product sells has an important relation to the price of the cost-elements; but no direct relation upon the least-cost combination. The least-cost combination is a combination of cost-elements solely. The price of the product nevertheless has an important influence upon the organization of the producing unit, and even the proportion in which the cost-elements are combined. Prices of the product may be such that producers frequently do not find it advantageous to produce in the least-cost combination. This matter is discussed in the next section under the head of the "highest-profit combination."

II. THE HIGHEST PROFIT COMBINATION

While it is not possible fully to explain highest-profit combination at this point, part of an explanation of it is highly necessary. It has already been stated that the entrepreneur is not interested in low costs as an end in themselves, but only as a means to an end, and that this end is the highest possible profit that he is willing to strive for; and that furthermore this highest profit is not necessarily obtained

when production is at the point of the least-cost combination. One combination of labor, power, supplies and raw materials used with a given flour-milling plant might give costs at $5.50 per barrel, output at 500 barrels, and profits at $.50 per barrel (the selling price being $6.00 per barrel), making $250 total profit; while another combination might give costs at $5.60 per barrel, output at 800 barrels, and profits only at $.40 per barrel, but making a total profit of $320. This is shown in more detail in Table XVI and Figure XXI. The least-cost per

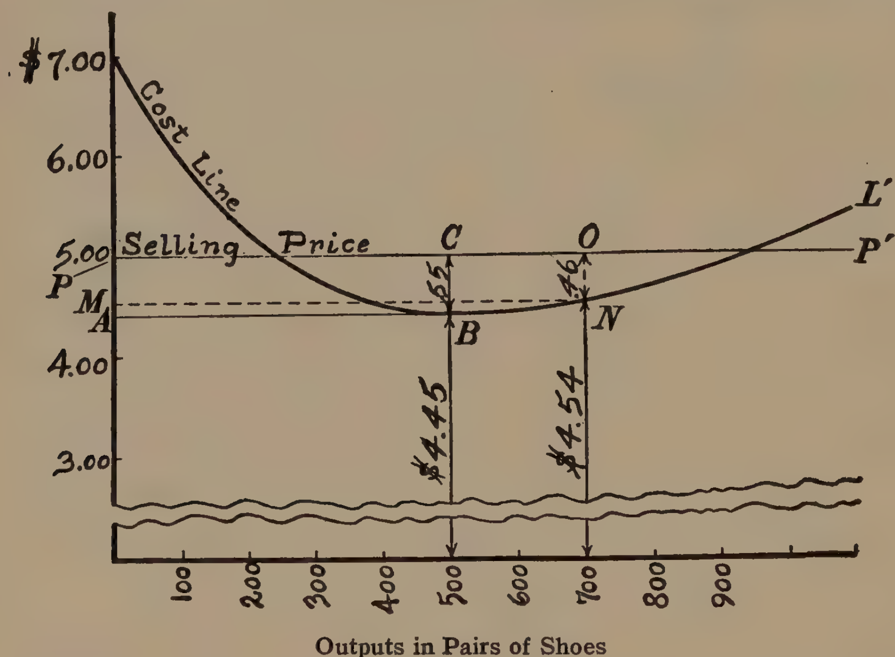


FIG. XXI. The Relation Between Least-Cost and Highest-Profit Combination.

pair of shoes is $4.45 per pair with an output of 500 pairs, but the total profits at this output are only $275, represented in the diagram by the rectangle PABC. At 700 pairs of shoes, the cost is $4.54 per pair, but the total profit is $322, represented by the rectangle PMNO. The second rectangle is enough longer to more than make up for its decrease in depth. Although the combinations are designated by their outputs here, what is really intended is a succession of input combinations giving 100, 200, 300, etc., pairs of shoes as outputs. In this illustration, the inputs giving 700 pairs of shoes as output represent the *highest-profit combination* of inputs.

TABLE XVI. HIGHEST-PROFIT COMBINATION

Output—number of pairs	*Cost per pair*	*Profit per pair* [1]	*Total profit* [1]
100	$7.00	—$2.00	—$200.
200	5.30	—.30	—60.
300	4.70	+.30	+90.
400	4.50	+.50	+200.
500	4.45	+.55	+275.
600	4.48	+.52	+312.
.700	4.54	+.46	+322.
800	4.64	+.36	+288.
900	4.80	+.20	+180.
1000	5.04	—.04	—40.
1100	5.40	—.40	—440.

[1] When sold at $5.00 per pair.

We are now able to see more clearly the relation between price of the product and combination of inputs. At $5.00 per pair, an output of anywhere from 300 to 900 pairs yields a profit of some kind. At $4.60

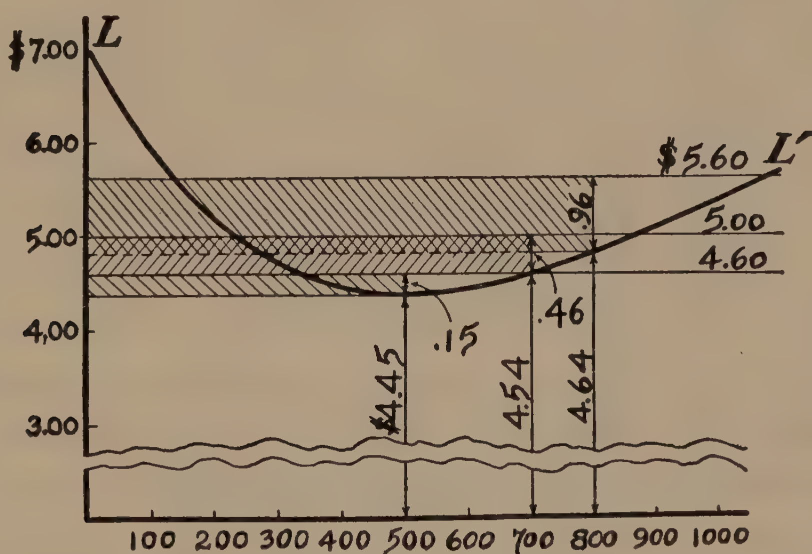


FIG. XXII. Highest-Profit Combination with Three Different Prices of the Product.

per pair, a profit could be made only with somewhere between 400 and 700 pairs; at $5.60 per pair, with anywhere from 200 to 1100 pairs. Table XVII shows profits with various outputs at two other selling prices, $4.60 and $5.60 per pair. Figure XXII shows the same effects graphically. The important thing to note is the manner in which the point of the highest-profit combination shifts with the selling price;

at $4.60 per pair, it comes with an output of 500 pairs, and at $5.60 per pair, it comes with an output of 800 pairs. A rise in the price of the product, costs remaining the same, moves the highest-profit combination to the right in the diagram; and a fall in the selling price moves it to the left. The point of highest-profit combination, however, can never come to the left of the least-cost point, since here both costs per unit and volume work together to make profits less. The three rectangles have profits per unit of $.15, $.46 and $.96 respectively, and outputs of 500, 700 and 800 respectively, as the selling prices range from $4.60 to $5.60 per pair of shoes.

TABLE XVII. HIGHEST-PROFIT COMBINATION WITH DIFFERENT PRICES FOR THE PRODUCT

Outputs–number of pairs	*Cost per pair*	PROFIT SELLING AT $4.60 PER PAIR		PROFIT SELLING AT $5.60 PER PAIR	
		Per pair	*Total*	*Per pair*	*Total*
100	$7.00	—$2.40	—$240	—$1.40	—$140
200	5.30	—.70	—140	+.30	+ 60
300	4.70	—.10	—30	+.90	+270
400	4.50	+.10	+40	+1.10	+440
500	4.45	+.15	+75	+1.15	+575
600	4.48	+.12	+72	+1.12	+672
700	4.54	+.06	+42	+1.06	+740
800	4.64	—.04	—32	+.96	+768
900	4.80	—.20	—180	+.80	+720
1000	5.04	—.44	—440	+.54	+540
1100	5.40	—.80	—880	+.20	+220

The business man, therefore, not only needs to be alert as to changes in cost-rates, as has already been pointed out, and know how to adjust his input combinations to meet them; but he must also be on the alert as to impending changes in the prices of his product, and know how to adjust his inputs and outputs to meet them. Every change in the level of prices or of cost-rates that is not accompanied by a proportionate change in the other, requires some sort of readjustment. The major and long-time changes in prices of products are usually accompanied by changes in the prices of the cost elements; but they accompany them frequently only after a while, or only part of the way; and many short-time changes take place in prices of products while the prices of their cost elements are standing nearly or entirely still. Readjusting to meet changing prices of products is therefore an almost ever-present problem in the business world.

The analysis thus far of highest-profit combinations has been entirely in terms of highest returns from a given plant. It should be apparent that this is by no means the final consideration. If an entrepreneur expends all his funds and all his effort upon a given plant, his only way of increasing his income is to increase his income from this plant. But after all, it is income to himself and not for his plant in which he is interested. Closer analysis later will show that the income for the plant varies with the entrepreneur and with the amount of effort which the entrepreneur puts into its management. Even the cost per unit of output depends upon the amount and quality of management associated with it. The relation of the entrepreneur to costs and profits will be discussed in the chapter on "The Size of the Business Unit."

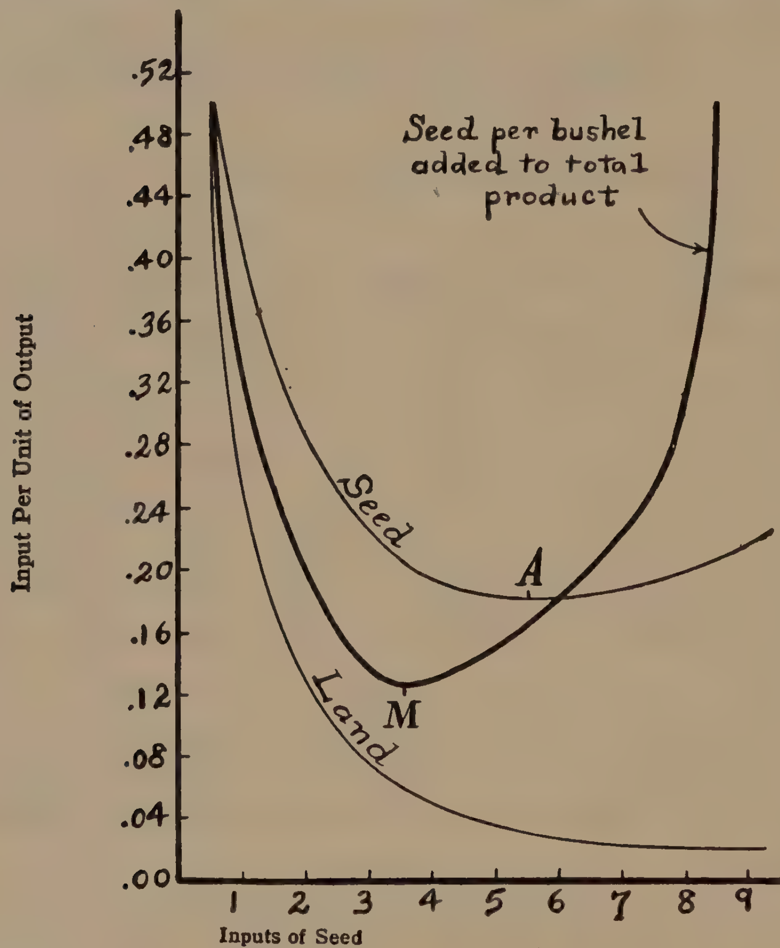
III. THE MARGINAL APPROACH TO THE PROBLEM

Under many circumstances, the actual approach which an entrepreneur will make to the problem of the most profitable proportion of the production elements will be by a method somewhat different from the foregoing, and simpler, namely, by balancing the effect on the expenses against the effect on receipts of any change in the proportion of the elements. Thus the addition of another hundredweight of fertilizer to an acre of land may add $2.00 to the fertilizer cost, and $1.00 of extra harvest labor costs. If the larger crop resulting sells for over $3.00 more, it has paid to add the fertilizer. This method, it is apparent, is very similar to the Method of Substitution used in Chapter IX for determining the proper combination of enterprises. There is the same balancing of effect on expenses against effect on receipts to arrive at the effect on net income. Any change in proportions of the cost elements which adds to the net income is a desirable change to make.

So far as the results obtained by this method and the one outlined early in the chapter are concerned, they are exactly the same. They are simply two different methods of determining the highest-profit combination. Fundamentally the difference between them is that the second method makes use of the curve of *additional* or *marginal outputs* as described in Chapter XI, instead of the curve of average outputs. To show this, one will need to compute one more set of data from Figure VI, namely, the data of *additional inputs per unit of additional output*, as in the following:

Inputs seed...........	1	2	3	4	5	6	7	8	9	10	11
Total outputs.........	2	6	12	20	27	33	38	42	44	44	43
Additional outputs.....	2	4	6	8	7	6	5	4	2	0	—1
Additional inputs......	1	1	1	1	1	1	1	1	1	1	1
Additional inputs per unit of additional output.	1/2 .500	1/4 .250	1/6 .166	1/8 .125	1/7 .143	1/6 .166	1/5 .200	1/4 .250	1/2 .500		

The curve for this, with its low point at M in Figure XXIII is simply the *additional* or *marginal curve* of Figure VI inverted in the same manner that the total and average output curves are inverted in Figure VII. It must cross the curve of seed inputs in Figure XXIII at exactly



Total Outputs	2	6	12	20	27	33	38	42	44
Inputs of Seed per unit of output.....	500	.333	.250	.200	.185	.182	.184	.191	205
Inputs of land per unit of output	500	.167	.085	.050	.037	.033	,026	.024	.023
Additional inputs per unit of output....	500	.250	.167	.125	.143	.167	.200	.250	.500

FIG. XXIII. Additional Inputs per Unit of Additional Output, Land Constant and Seed Varying.

the same input that the average and additional curves cross in Figure VI, that is, at point A. If a cost-rate of $.50 a peck is applied to these additional inputs, the additional seed cost resulting from using a second peck of seed per acre will amount to only $.125 per bushel of

additional output (.50 × .250); from using a third peck of seed per acre, \$.083 per bushel (.50 × .166); from using a fourth peck, \$.0625 cents per bushel (\$.50 × .125), which is the lowest amount obtainable. From here on, using additional pecks per acre will give increasingly higher seed costs per bushel as follows: 5th, \$.0714; 6th, \$.083; 7th,

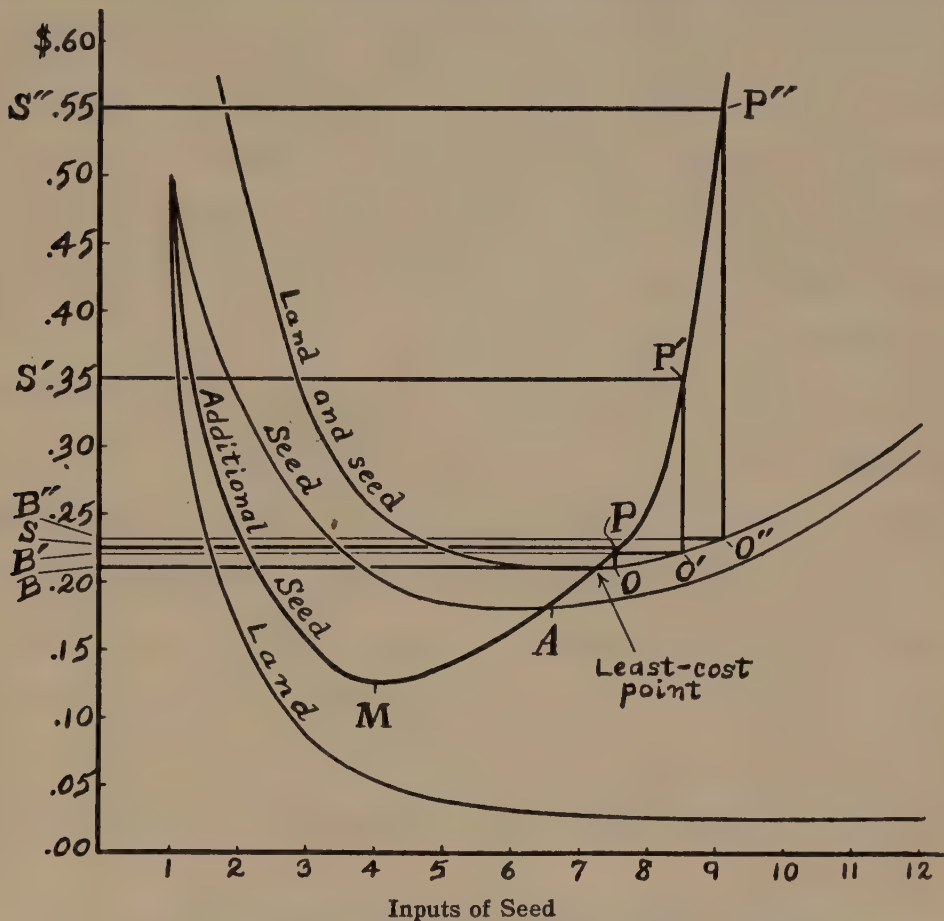


Fig. XXIV. Relation of the Marginal-Cost Curve to the Highest-Profit Rectangles.

\$.100; 8th, \$.125; 9th, \$.250. Now any increase in seed inputs that is accompanied by a reduction in seed costs per bushel, such as occur up to the fourth peck of seed per acre, unless it is offset by some resultant rise in costs of other elements of production, is certain to be advantageous. But how about the increase in seed inputs that is accompanied by rising seed costs per bushel, as are the 5, 6, 7, 8 and 9 pecks per acre? The answer is, according to the marginal method of analysis, which consists of balancing additional expenses against additional receipts, that *it will pay to use additional seed per acre as long as the additional product more than pays for the additional cost of the seed.* If by adding another peck of barley seed per acre, which costs 50 cents, the yield is increased four bushels, as with the eighth

peck, and these four bushels will sell for $1.00, and no other costs are increased, it will surely pay to add the eighth peck of seed. Since the ninth peck of seed, however, adds only two bushels to the yield, it will just pay for itself on this basis. If the seed were to cost $1.00 per peck, the eighth peck would just pay for itself with the product selling for $.25 per bushel. With the product selling for $.50 per bushel, even the ninth input would pay for itself. Thus change in either cost-rates or selling price will change the input which gives the highest-profit combination. Actual values of seed and product are grossly misrepresented in the illustration; this has been necessary because seed is so small a part of the cost. If the input amounts here used were fertilizer or labor in place of seed, the figures assumed would appear more reasonable.

To show further how this method of attack must lead to exactly the same conclusions and the same combination of the elements of production as the least-cost and highest-profit analysis presented in this chapter, Table XVIII and Figure XXIV have been included. Table XVIII is a continuation of Table XIII. The cost-rates for seed have been changed from $.50 to $1.00. Highest-profit combinations are calculated for three selling prices, $.225, $.35, and $.55 per bushel, in exactly the same manner as in Table XVII. In Figure XXIV, the accompanying profit rectangles are drawn in exactly the same manner as in Figure XXII. The profit rectangle for the selling price of $.225 is BSPO; for the selling price of $.35, B′S′P′O′; for the selling price of $.55, B″S″P″O″.

TABLE XVIII. DATA FOR FIGURE XXIV

Input seed	*Total output*	COST PER UNIT OF OUTPUT			*Cost of additional seed input per unit of output*	TOTAL PROFIT WITH PRODUCT SELLING AT:		
		Seed $1.00	*Land* $1.00	*Both*		$.225	$.35	$.55
1	2	.500	.500	1.000	$.500	—1.55	—1.30	—.90
2	6	.333	.167	.500	.250	—1.65	—.90	+.30
3	12	.250	.083	.333	.166	—1.30	+.20	+2.60
4	20	.200	.050	.250	.125	—.50	+2.00	+6.00
5	27	.185	.037	.222	.142	+.08	+3.45	+8.85
6	33	.182	.0303	.212	.166	+.43	+4.55	+11.15
7	38	.184	.026	*.211*	.200	+*.55*	+5.30	+12.90
8	42	.191	.024	.214	.250	+.45	+*5.70*	+14.10
9	44	.205	.023—	.228	.500	—.10	+5.40	+*14.20*
10	44	.227	.023—	.250	....	—1.10	+4.40	+13.20
11	43	.256	.023+	.279	....	—2.32	+3.05	+11.65
12	41	.296	.024	.320	....	—3.78	+1.35	+9.55

The curve of costs of additional seed inputs passes through the upper curves of these rectangles, *at the point where the additional costs and the selling prices meet.*

If any producer knew what the effect on his output would be of adding each of several inputs of seed or fertilizer or labor or equipment, and knew what the additional outputs would cost, and what the additional outputs would sell for, he could, by using the marginal method of attack, answer the question as to whether or not it would pay him to add each of these inputs. But the information which he would need for this is exactly the same as he would need for figuring least-cost and highest-profit combination. The only difference is that the input data is expressed in one case as average inputs per unit of output; and in the other as additional inputs per unit of output.

Data of this kind are not easy to obtain. Small business enterprises, like shops, farms, and retail stores, are never likely to have data of this kind of their own. Securing it, for them, is a job for a trained investigator who will assemble and analyze the data from a considerable number of small units. In the case of farm production, frequently the data need to be collected for a series of years so as to overcome the effect of varying rainfall and other weather conditions. Some of such data are best obtained by setting up experiments in which as many as possible of the conditions affecting the output are held constant while the elements of production are varied one at a time. Large producing enterprises can of course carry on many such experiments in their own plants.

Very often statistical analyses or experiments of this kind can be conducted in such a way as to answer particular questions without going through the whole process necessary to determine the least-cost and highest-profit combination. For example, a manufacturer may be in a position to change his production process only in one detail, such as by using more labor, or more power, or more salesmen. A statistical analysis or an experiment made for his plant might enable him to forecast the effect on his output with considerable accuracy. He could make his analysis from this point on by either of the methods here outlined. If he figured least-cost and highest-profit combination, all the elements except the one varied would be handled as fixed.

There are many instances in which some of the elements used in a production process cannot be valued with any degree of accuracy. In discussing the cost-accounting method in Chapter IX, we pointed out how generally this is true on farms and in small shops or retail

stores. This means that cost-rates cannot be made available for some of the elements of production. In such cases, either of the two procedures is possible. By the one, least-cost and highest-profit combination could be figured for the remaining elements and the "profit rectangle" obtained considered as payment not only for the entrepreneur, but also for the elements not valued. Thus the operator of a small retail store making an analysis on this basis would be able to say that one combination of inputs gave $1400 as return to himself and the members of his family helping him, and another combination gave a return of $1800 to the same persons. No doubt the amount of effort put into the enterprise by the storekeeper and his family in the two cases would be considerably different; but the analysis would not be able to show this. All that the storekeeper could do would be to ask himself whether the extra $400 would be worth the extra effort he and his family would put into the enterprise. By the marginal attack, the cost of the additional inputs of the changing elements would be balanced against the additional income to the store, and the storekeeper and his family would have to decide just as by the other method whether the extra net income made the extra effort worth while. In most such cases, the marginal attack is by all means the better of the two.

SUGGESTIONS FOR FURTHER READING

F. M. Taylor's *Principles of Economics* (1921), contains a discussion of the Least-Cost Combination in Chapter XI, pp. 146–153. United States Department of Agriculture Bulletin 1277, *Input as Related to Output in Farm Organization and Cost of Production Studies* by H. R. Tolley, J. D. Black, and M. J. B. Ezekiel, pp. 24–35, applies the methods developed in this chapter to the determination of the Least-Cost Combination and the Highest-Profit Combination for certain farm enterprises.

PROBLEMS

1. If only two elements are used in production, a fixed and a variable element, and either of them is free (without cost), in what proportions will they be combined?
2. Apply cost-rates of $10.00 per machine and $2.50 per laborer to Problem 16, Chapter XII, and:
   a. Calculate least-cost combination.
   b. Draw a diagram showing separate curves for each element and also a combined cost curve.
   c. Calculate output per dollar of input. Show that this can be obtained either by adding the costs of elements together and dividing into total output, or by taking the reciprocal of combined costs per unit.
   d. Draw a diagram showing this curve.

3. If all elements rose 10 per cent in cost, would this move the least-cost combination?
4. In a production problem involving several elements, could the costs of all factors change and the least cost still remain in the same combination as before?
5. Small milk distributors often have as low costs per unit as large concerns and can therefore compete with them. If cost per unit curves were drawn for each element, would they be alike for small and large plants?
6. Why are telephone companies operated at increasing costs if inputs are measured in number of phones installed?
7. Why are there several telephone exchanges in a large city instead of one large central?
8. Assume an increasing number of trains to be handled over one railroad right-of-way, the increasing number being handled first by a single-track system, then by a double-track system. What would be the shape of curve of outputs per unit of input?
9. Why are there often such wide variations in bids offered by contractors for erecting the same structure when kind and quality of material and time of completion are specified?
10. Would least cost of getting an education enter into a student's calculation if the question were whether or not to go to summer school?
11. a. Apply the following sets of cost-rates to Problem 21, Chapter XII.

1. Land $20.00	2. Land $10.00	3. Land $20.00
Seed $1.00	Seed $4.00	Seed $2.00
Fertilizer $1.00	Fertilizer $.50	Fertilizer $2.00

    b. Draw a diagram showing curves for two of these sets of cost-rates, using solid lines and dotted lines to distinguish them. (Note—students must bring this on day due and the instructor will use the data of all the class to show the least-cost of all possible combinations.)
12. Some hotels and similar institutions rent the sky above adjacent property to prevent other high buildings from being erected and shutting out the light. How does this affect cost of operating these hotels? How does it affect costs of building on adjacent property?
13. How does the supplementary relationship in agriculture affect the calculation of least-cost of any one enterprise? Of the farm as a unit?
14. The drivers of milk wagons in Minneapolis are paid a commission on every quart or its equivalent that they deliver above a certain amount. How does this affect cost of delivering milk?
15. How does the cost of a lot suitable for an apartment house affect the size of the building best suited to the location?
16. How does the combination of short stories and advertising affect the least cost of publishing a periodical like *Collier's* or the *Saturday Evening Post?*
17. How does least-cost combination enter into the calculation of the number of chairs to put into a barber shop?
18. Many concerns say they sell cheap because their costs are low due to

large volume. Is there a limit to reduction in costs from increasing the volume? If so, where does it come?

19. Many universities have large lecture sections instead of smaller classes as a means of reducing costs. Show that costs per student are reduced in this way. How about cost per unit of output?
20. Would a manufacturer who held all factors constant and varied one till he found the best combination, then held this one constant at this point and varied another one, etc., ever succeed in finding the best combination?
21. What would you expect the shape of a curve of advertising costs per unit of sales to look like? Why?
22. Suppose you were going to start a certain business and had access to cost data of many similar plants, what use could you make of them?
23. Why are not least-cost and highest-profit combinations the same?
24. Two fields of potatoes on peat soil near Anoka could be dug cheaply using a digging machine, but because the potatoes grew so deeply in the loose soil, about a fourth of them would be left in the soil. Or they could be dug with a fork by hand labor and all removed. One farmer tried one of these methods and made a profit, and the other tried the other and lost. Show that this involved both least-cost combination and highest-profit combination.
25. From the data given in Problem 11, locate the highest-profit combination for each of the three sets of cost-rates. The selling price of the product is $1.00 per bushel.
26. As additional labor is added to a machine, the total output varies as follows:

Machine Inputs.....	1	1	1	1	1	1	1	1	1	1	1	1
Labor Inputs.......	1	2	3	4	5	6	7	8	9	10	11	12
Total Outputs......	2	4	8	16	30	38	44	48	51	52	50	48

With machine costs at $10.00, labor costs at $4.00, and the selling price of product $3.00, prepare a table showing:

1. Physical inputs per unit of output.
2. Cost of each element per unit of output.
3. Combined cost per unit of output.
4. Profit per unit of output.
5. Total profit at each combination.
6. Locate the least-cost combination and the highest-profit combinations.
7. Assume that you are operating at the fourth combination and show by the marginal analysis how you would decide whether to add more labor.

27. Use the data in the preceding problem and calculate the additional input per unit of additional output for each combination. Calculate the additional cost per unit of additional output.
28. At what combination do the additional costs per unit of additional product exceed the additional receipts. Does this point correspond with the point of highest-profit located in the preceding problem?

CHAPTER XIII

INDIVIDUAL DIFFERENCES AND THEIR COMBINATION

In the two preceding chapters, the production elements are combined merely as *numbers* and *quantities* of each—so many acres of land with so many hundredweight of fertilizer; so many men with so many machines in one factory. It is assumed that all acres of land are alike, and all men and all of any kind of machine. It is hardly necessary to state that this is very far from a true assumption. Chapters VI and VII on specialization by persons and areas showed the significance of differences between individual persons and areas in determining what each will produce. In this chapter, it is proposed to show the significance of these differences in determining what particular men, machines, buildings, land, seed, etc., are combined in a given production process. It is of much importance what type of laborer is set to work with a given quality of machine; what type of salesman is put at work selling a particular grade of commodity; what variety of wheat is planted on a given piece of land; what type of farmer or laborer feeds and cares for a given type of cow. Economists have in general rather neglected these differences between individuals in working out their analyses of the combination of the elements. The men in charge of actual production have no other fact thrust upon them so often and so violently as the differences between individual units of the elements, particularly between individual men. They have to recognize these differences in all their decisions and provide for them in all their organization plans. It is small wonder, then, that finding in economic analysis no provision whatever for individual differences, they hastily conclude that it is unreal and probably valueless for them.

Our objective in this chapter is to present the principles relating to combination of individual differences; but before we can do this we must discover some way of measuring these differences.

I. DIFFERENCES IN PRODUCTIVITY

There are as many differences between individuals and individual things as there are words in the language to name them. Laborers,

vary in strength, endurance, intelligence, knowledge, honesty, loyalty, etc.; land varies in rainfall, topography, drainage, plant foods, etc.; cloth in color, weight, weave, durability, warmth, etc.; apples in color, taste, keeping quality, time of ripening, etc. All of these differences are significant from one point of view or another. The color and taste of apples are significant from the point of view of consumption; their perishability and time of ripening from the point of view of their marketing and storage. In this course our interest in things is from the point of view of *production*. The differences between individuals in which we are interested are their differences in *productivity*, defined in Chapter II as *power to contribute to a product*. A man may have as much knowledge of geography as a Yale professor in that subject; but if his work is auditing public utility accounts, this knowledge will not avail very much on the job. Blue eyes and curly hair may contribute something to the productivity of a floorwalker in a department store; but not to the productivity of a bookkeeper or a teamster. One kind of coal may contain a half more heat units per pound than another; but unless they occur in such form that they can be delivered in a boiler, they do not make the coal any more productive.

The various possibilities and methods of measuring differences in productivity of individual persons were discussed in Chapter X in connection with the problem of fitting men to jobs. It was pointed out that physical tests could be made of such things as muscular strength, sight, automaticity, etc.; and that considerable success has been achieved in measuring some mental aptitudes. Soils and feeds can be submitted to accurate chemical and physical analysis; fuels to thermal tests; engines to brake tests; construction materials to actual tensile, compression, and shearing stresses; and the various metals and alloys of metals to tests of durability, resistance to tarnish, electrical conductivity, etc. Some of these measures have been reduced to a high degree of accuracy and refinement. *None of them*, however, *is a measure of actual productivity*. In the case of electrical conductivity, it is no doubt possible to *predict* physical productivity of a transmission line from the test with a high degree of certainty. The same is almost equally true of strengths of building materials, although in actual practice, a "safety factor" is always introduced to take care of errors in measurement. The physical productivity of foods and feeds can be forecasted with reasonable certainty from measurements that include digestibility as one of the characters. The discovery of the vitamins in recent years, however, has revealed the possibility

of whole new reaches of differences between foods. Productivity of soils is probably more difficult to forecast from measurements than the productivity of feeds. Physical properties of form and texture play a rôle in soils which is difficult to measure. The effects of soil bacteria are only partly understood. It is in the case of life forms, particularly of human life, that forecasting productivity from measurements is least certain of all. This does not mean that efforts to this end should be dropped. The success thus far obtained amply justifies continuing the work.

Because, however, many of the measures at present in use are inadequate indicators of physical productivity, and because in the last analysis, all measurement designed to indicate productivity must be checked against actual performance, most reliance is still placed upon the results of actual production use. The fuel is actually burned in the furnace; a crop is actually grown on the land; the cloth is actually worn.

The results obtained by such methods give what are popularly recognized as measures of difference in productivity. The land that

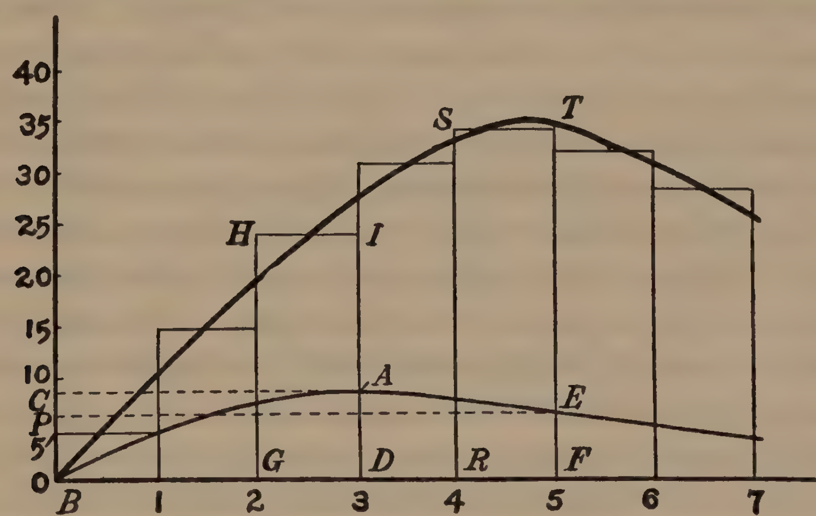


FIG. XXV. Output Rectangles Used as Indexes of Productivity of an Engine.

gives the largest yield per acre, or the furnace that delivers the most heat, is said to be the most productive. But some perplexing questions arise with respect to using these yields or outputs as measures. Figure XXV illustrates the first of these difficulties in terms of an engine and fuel. As the inputs of fuel increase from 1 to 7, the outputs increase from 5 to 34 horse power and then decline to 28 horse power. Each of these outputs in the figure is represented by an upright rec-

tangle. The output for the 3rd input of fuel is represented by the upright rectangle GHID, and the output for the 5th input by the rectangle RSTF. These rectangles are drawn to fit the curve of total outputs. Rectangles BCAD and BPEF are exactly equal to the two foregoing rectangles. The only difference between them is that they are drawn to fit the curve of average outputs. The area of the rectangle RSTF equals 34 times 1 (engine); the area of the corresponding rectangle BPEF equals 6.8 times 5 (inputs of fuel). The perplexing question is: For which input will the output be taken as the measure of productivity of the engine? For the 3rd input, or the 5th, or the 7th, or which? It happens that the 3rd represents highest average output, and the 5th highest total output.

Those who are comparing productivities in terms of outputs are probably in most cases merely comparing them under the conditions under which the individual producing elements are ordinarily used. As observed in common use, one tract of land yields more wheat per acre than another; hence it is more productive. Not much consideration is given to the fact that the inputs of labor, seed and management may differ considerably as to quantity and quality. When pressed closely, most such persons would admit that the foregoing was hardly an adequate basis of comparison. Some, if forced to a definite statement on the subject, would say that true productivities should be compared at the point of diminishing total outputs—the 5th input in Figure XXV. They would say that this indicates *maximum potential productivity*. Others would say that productivities should be compared at highest average outputs—at the 3rd inputs. Probably from the standpoint of pure physical productivity, the highest average outputs more nearly fit the needs of a good measure than any other outputs. Most people would agree, for example, that the true physical productivities of two engines is more nearly measured at the points of highest output per unit of fuel and other inputs than at their points of maximum potential output.

But in the last analysis, what we are concerned with is *economic* and not physical productivity. Economic productivity must be measured at the point of most economical use, and this is at the point of *highest-profit combination*, which we learned in Chapter XII is always located somewhere between the points T and A of highest total and highest average outputs. Let us *definitely* understand from this point on that *economic productivity is always measured at the point of highest-profit combination.*

Of similar nature is the difficulty as to the *type* of input element to be used in comparing productivities. If some other kind of fuel than the above were used the rectangles BCAD and BPEF would have different areas, and the comparison of productivities would not be the same. Some engines are built to use one kind of fuel and some to use another. The question at once arises as to whether any comparison of productivities in terms of one particular fuel is a proper one. Should not each be used in that combination for which it was intended, or for which it is best suited? Surely so. The true test of comparative productivity must be when the elements in question are each used in their most advantageous combination with other elements. A furnace built to burn stove coal can never be judged as to its true productivity in a test in which pea coal is burned.

A third difficulty is that the conditions under which actual production takes place are very inconstant. No two crop seasons are exactly identical, no two seasons for selling shoes. This difficulty can be obviated in good part if a series of years can be included in the analysis.

By all odds the most serious difficulty involved in the comparison of production is that different units *give their most advantageous use at different inputs*. This is illustrated by Figure XXVI. Highest average outputs for Engine I and II are at 3 and 4 inputs respectively. The total outputs at these points, measured by the rectangles BCAD and B′C′A′D′, are as 24 is to 48. If outputs at T were used as measures, the comparison would be as 34 is to 72. The comparison of economic productivities would be somewhere between these two. But it cannot really be said that these rectangles measure the relative productivities of these two engines. Rectangle BCAD is the product of Engine I plus 3 inputs of fuel; rectangle B′C′A′D′ is the product of Engine II plus 4 inputs of fuel. *Part of the difference between 24 and 48 is due to the extra input of fuel.* Engine II *contributes to the product* only part of the extra 24. It cannot be said, therefore, that Engine II is twice as productive as Engine I. The situation would be the same if we were talking about the rectangles at their points of economic productivity instead of their points A's, except that the ratio of size of rectangles would be a little less than 2 to 1. The product obtained is never the output of just the one element, but of at least one other element besides. The power obtained from an engine is the combined product of the engine, the fuel and the man tending the engine. The yield of wheat from an acre of land is the combined product of the particular seed sown, the labor of fitting the land and

planting the seed and harvesting the crop, and the machinery used in all these operations, as well as of the land itself.

The same difficulty would exist if the two engines used different types of fuel to best advantage. Much of the greater product of Engine II might be due to the different *kind* of fuel used.

This method of comparing productivities could only be used, therefore, if we were content to try out the different engines under exactly

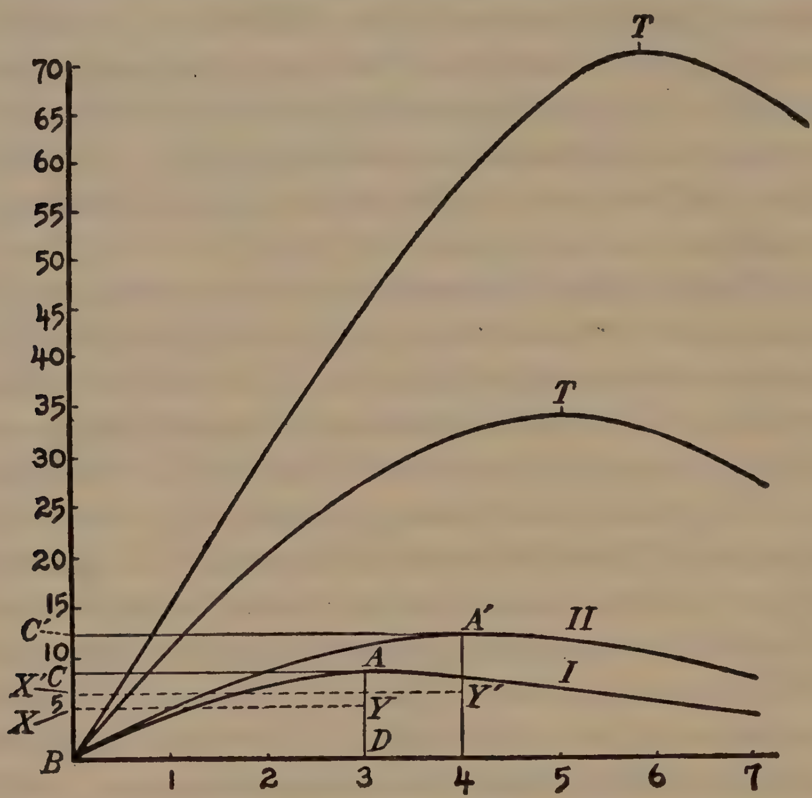


Fig. XXVI. Productivities of Two Engines when Using a Certain Fuel Compared on the Basis of Output Rectangles at Point of Highest Average Output.

similar conditions, with the same inputs of fuel, same kind of fuel and all other inputs alike. But this would certainly give a very untrue comparison of productivities except in those few cases in which highest-profit combination of the units compared came with the same inputs.

The rectangles, however, can be taken as true comparisons of the productivities of combinations. For many purposes, it is worth while to compare units of producing elements in terms of the productiveness of the combinations in which they are most advantageously used.

For reasons that cannot be explained till a little later in the chapter, the productivities of the combinations in which different

units are most advantageously used, can be made the basis of *ranking* the productivities of the units. A unit which has a higher economic productivity rectangle than another is always more productive than it. The point is that it is not twice as productive,—that is, does not contribute twice as much to the product when its economic productivity rectangle is twice as large. Some of the differences are due to the other inputs. Understood in a certain way, also to be explained later, differences in areas of productivity rectangles may also go farther than merely rank the different units as to their productivities.

Modern statistical method is also furnishing help toward the solution of this problem. Given several score of combinations, it is now sometimes possible by statistical methods to compare their productivity rectangles and determine how much each input element contributes to the product at the various inputs. It should also be possible to include differences in characteristics of individual producing units in such an analysis. We could then tell how much of the additional 24 in the rectangle for Engine II is due to the additional input of fuel, and how much to intrinsic differences between Engines I and II. If this were done, then the rectangle of productivity in Figure XXVI could be split into two parts as indicated by the dotted lines XY and X′Y′. It is here assumed that the rectangle XCAY and X′C′A′Y′, with areas of 12 and 26 respectively measure the relative contributions to the product of Engines I and II. This will leave 10 as the addition to the product of the extra input of fuel used with Engine II.

Under certain important assumptions, approximately the same results as the foregoing are actually obtained merely by letting the profit rectangles of Figures XXI and XXII be used to represent the contribution to the product of the fixed element whose productivity is being compared. Such a comparison would necessarily be in terms of economic productivities, of values of product contributed by the elements being compared. The important assumptions involved in such a procedure are first that the *prices received for the product are exactly the same for all the individual producing elements being compared,*[1] *and that the cost-rates for the input or inputs also exactly reflect their contribution to the product.* If the price of fuel were out of line with its contribution to the product, then the profit rectangles would be smaller than they should. If the entrepreneur using one of the units

[1] Either quality of product must be the same, or else price must be exactly adjusted to differences in quality.

being compared, had bought his fuel for less than the prevailing price, this would be reflected in the size of the profit rectangle for it. Needless to state, the elements must also be combined according to their highest-profit combinations.

This method, it will now be apparent, is the method of comparing *net* products. One cow produces 500 pounds of butterfat which sells for $200, and another 300 pounds which sells for $120. The cost of the feed and other inputs for the first cow is $125; for the second cow, $80. It is assumed that each is fed at its highest-profit combination. The ratio of economic productivities is as $75 is to $40. Such a method of comparing economic productivities obviously will appear very practical to those engaged in actual production. In practice, however, meeting the conditions laid down above of the same price, proper cost-rates, and use in highest-profit combination, is very difficult. The measures of comparative productivity obtained in this way therefore fall far short of scientific accuracy.

The foregoing discussion has been directed toward comparing the productivities of different engines, or cows, or pieces of land. In each case, these have been taken as fixed elements, and inputs of fuel, feed or fertilizer have been varied in order to get at a comparison of the productivities of the fixed elements. If productivities of fuel, feed or fertilizer were desired to be compared, the procedure would be to hold these as fixed and vary the size and type of engines or cows or tracts of land. The highest-profit combination obtained in this way would be the same as if the engines, cows or land were held fixed. The rectangles of net products would, however, represent what was left after cost-rates were applied to the engines, cows, or land. A mistake in cost-rates for these would spoil the accuracy of the comparison of productivities of fuel, feed and fertilizer.

II. CAPACITY AND EFFICIENCY

Productivity is a very broad term. Two individuals may have the same productivity, but differ greatly in the manner in which they attain it. Two cows may have identical net products, but one may be a large cow consuming a great deal of feed, and the other a small cow utilizing a smaller amount of feed more effectively. One manager may make a large net income by running a large business in a somewhat slipshod manner; another manager may make as large an income by running a small business very efficiently. The method of breaking up productivity which is most useful is that suggested by the two

foregoing illustrations—into *capacity*, or size, and *efficiency*. Webster's dictionary defines capacity as "power of receiving, containing, absorbing." Thus we speak of the capacity of a vessel as the amount that it will hold, or the capacity of an auditorium as the number of people it will seat. The nearest equivalent of capacity in the terminology which we have been using thus far is expressed in terms of *input*. This is entirely obvious in the case of a vessel or an auditorium. In the case of a factory building, the input or capacity is the number of machines that it will hold, or the number of workmen it will provide work for, or the amount of raw material it will use. The capacity of a cow is the amount of feed she will consume. The capacity of land is the amount of seed, or fertilizer, or man labor, or horse labor, or equivalent, that it will use. Sometimes, however, capacity is expressed in terms of output rather than input. Thus a mill is designated as having a "capacity of a thousand barrels a day;" or an engine is designated as delivering a certain number of horse power. These are obviously loose uses of the term—at least, they are not consistent with Webster's definition of capacity as power to *receive*, *hold* or *absorb*. In many cases, it is true, there is a rough correlation between input and output, as between bushels of wheat *received* and barrels of flour ground, so that no great inaccuracy may result from the practice. It will be understood, however, that capacity really refers to input—it will be used only in this sense in this treatise.

Obviously the size or capacity of the unit in which any element occurs is fully as important as the number of the units. Nine 40-ft. cars will haul as much wheat as ten 36-ft. cars. One large locomotive may pull as many 40-ft. cars as two small locomotives. One fast worker may make a machine turn out twice as much output as one slow one. An acre of fertile soil with the same amount of labor may yield several times the product of an infertile one. Not all of these are differences in size in the ordinary and physical sense of the term; but they are of the same general significance in production as differences in size in the physical sense. Moreover, mere differences in physical size may not be very significant. A properly arranged small plant may turn out more product than a somewhat larger one poorly arranged. One tractor weighing two tons may do more work in a day than another weighing three tons. Obviously such measures as volume, weight and area are poor measures indeed of the property of producing units in which we are really interested. We need a term which is more comprehensive than any of these, and which is at the

same time more exact. That term is *capacity*. Size is the nearest equivalent, but it is not a very good equivalent.

Webster defines efficiency in the mechanical sense as "ratio of energy or work that is got out of a machine to the energy put in." In this treatise, efficiency will be defined simply as *net output per unit of input*. This definition is not really identical with the mechanic's definition, but it is closely parallel to it. As in the case of capacity, the nearest equivalent we found in the language was "size," so in the case of efficiency, the nearest equivalent is "quality." We apply the same seed and labor and fertilizer to two pieces of land and obtain very different products. We say that one is a "good" piece of land and the other is a "poor" piece of land. Given the same raw material, labor and power, a good churn will turn out more and better butter than a poor one. Given the same goods and the same customers, a good salesman will sell more goods than a poor salesman and make his customers better satisfied. The units of nearly all producing elements differ greatly in "quality." The machines turned out by modern highly standardized factories, and such supplies as chemicals, drugs, salt, etc., are about as nearly uniform in quality as anything. Quality, however, is a rather loose term. As popularly used, it often includes some of what we have called capacity as well as efficiency. By quality in land we probably mean what it will yield at point of greatest output per unit of input without taking account of the input necessary to secure this yield. It is obviously desirable, therefore, to introduce the more exact term *efficiency*, meaning by it net output per unit of input.

The term efficiency itself, however, is also used somewhat loosely at times—often, for example, in the sense of general productivity. Thus one worker is said to be more efficient than another when all that is meant is that he gets more results or better results—nothing is said of the input necessary to secure these results. But if a large number of uses of the term efficiency are brought together and analyzed, it will be found that running through most of them is something of the idea of output per unit of input. A large output does not seem to be enough for high efficiency in most of the statements; it must be large in proportion to input. This we surely have in mind when we speak of an efficient machine, or an efficient factory, or an efficient cow, or even an efficient salesman. That these two characteristics of a producing unit, capacity and efficiency, really do in effect break productivity into parts or phases, is evident from the mathematical relationship

between them. *Capacity times efficiency equals productivity;* or expressed more exactly, the product of the input which represents the capacity of producing unit, times the net output per unit of this input, or its efficiency, equals the productivity of the engine. This may be illustrated in Figure XXVI: the input or capacity of the smaller engine as represented by BD; the efficiency by AY; and the productivity by the rectangle XCAY. Capacity and efficiency are therefore sometimes referred to as the "two dimensions of productivity." [1]

Before proceeding further along this line, however, we need to obtain a clearer notion of the real import of capacity and efficiency. First of all, we will need to understand that it is just as difficult to isolate the capacity and efficiency of a producing unit as it is its productivity. The quantity or size of the other element used with the one being analyzed is going to determine the output per unit of input and hence the efficiency. Gross outputs per unit of input include the efficiency of the inputs themselves as much as that of the producing unit whose efficiency is being analyzed. The height of the line AD is due to the properties of the fuel as well as to the properties of the engine. The same is true of the other dimension of the rectangle BCAD. Gross output may, however, be used as a basis for ranking different engines in their efficiency. The definition of efficiency given above is in terms of *net* output. This assumes that the product rectangles BCAD and B′C′A′D′ of Figure XXVI can be split as in the diagram. If they cannot in the physical sense, they can in the economic sense, after the manner outlined for productivity. This leads to the distinction between *physical* and *economic* capacity and efficiency. In the economic sense, surely both capacity and efficiency will want to be measured at the point of highest-profit combination, located somewhere between A and T depending upon the cost-rates of the two elements and the selling price of the product. The economic capacity of an individual element of production will be based on the number of the inputs of the other elements at the point of highest-profit combination. The index of economic efficiency will be based upon the outputs per unit of input at this same point. This is illustrated by Figure XXVII, in which increasing amounts of the same kind of fertilizer are applied to two tracts of land. The points O and O′

[1] Dr. H. C. Taylor used the terms capacity and efficiency in much the same sense in which they are used in this textbook in a paper before the American Economic Association at Columbus in Dec., 1916. He spoke of capacity and efficiency as the "two dimensions of productivity."

respectively are assumed to represent the inputs which give the highest-profit combination for the two tracts. The fertilizer is assumed to be equally well suited to each tract of land. The economic capacities of the two tracts of land will be as BD is to BD′, that is, as 9 is to 10; and the economic efficiencies will be as OY is to O′Y′, that is, as 9 is to 8. It goes without further explanation that their economic productivities will be as XCOY is to X′C′O′Y′, that is, as 81 is to 80. If the fertilizer were not as well suited to Tract II as to Tract I, some other fertilizer might increase the relative efficiency or capacity of Tract II sufficiently to make its productivity exceed that of Tract I.

Anything which moves the location of point O for any producing unit will change its relative capacity and efficiency. A rise in the

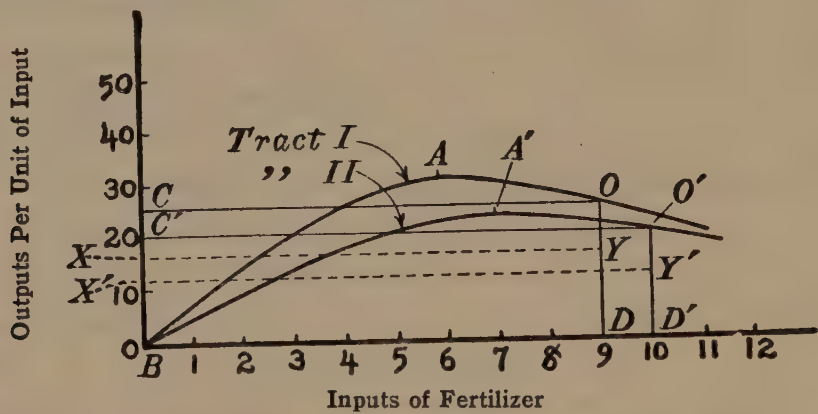


FIG. XXVII. Comparison of Economic Capacities and Efficiencies of Two Tracts of Land in the Use of a Certain Type of Fertilizer.

price of the product or the cost-rates may reverse the rankings of two producing units. This is entirely in keeping with common experience. For example, when fertilizer is cheap, or water is available at low rates, the relative economic efficiency of sandy land may be greatly increased. High wages for labor may reduce the relative efficiency of a type of machine using much labor.

Physical efficiencies may conceivably be compared at any input desired. The physical output per unit of input can be indicated for 1, 2, 3, 4, or any number of fertilizer inputs per acre. Physical capacities may be compared either at the point of highest physical efficiency, that is, at the point of maximum output per unit of input, or at the point of diminishing total outputs. The former is the more reasonable practice in most respects. Accordingly, all references in this textbook to the physical capacity of a producing unit, are based upon inputs at the point of highest average outputs, or maximum physical efficiencies. And although physical efficiencies can properly be com-

pared at any input, the understanding in this textbook will be unless some particular input is designated, that the comparison was made at the point of physical capacity as just defined.

Figure XXVIII shows the physical capacities of three different machines for labor as DF, DF and DI when compared at the points of

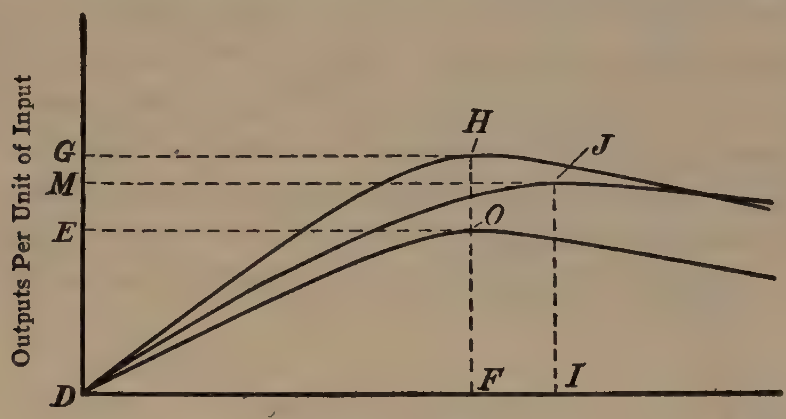


FIG. XXVIII. Physical Capacities and Efficiencies of Three Machines for Labor Compared.

maximum outputs per unit of input. The gross efficiencies are FO, FH and IJ respectively. Net efficiencies are not indicated. It is assumed for the sake of simplicity that if they were they would show the three machines ranking the same in net efficiency as in gross efficiency. Two of these machines have the same physical capacity,

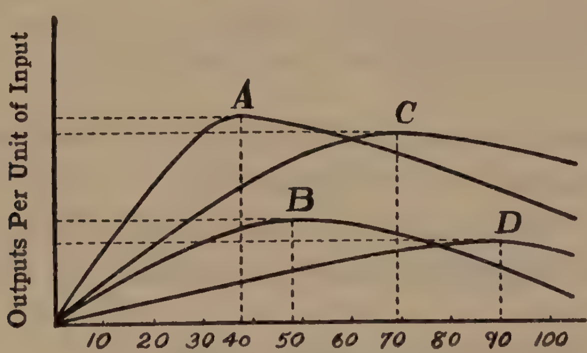


FIG. XXIX. Physical Capacities and Efficiencies of Four Different Managers for the Same Labor Compared.

but different efficiencies at point of capacity—OF and HF respectively. Figure XXIX compares the physical capacities and efficiencies of four managers when supervising exactly the same kind of labor. Manager A has low capacity, but high efficiency at the point of capacity; Manager B, low capacity and low efficiency; Manager C, high efficiency

and high capacity; and Manager D, high capacity and low efficiency. Manager B uses relatively little labor and makes a small return upon it. Manager C uses a great deal and yields a large return upon it. At 40 units of input, these four managers rank in gross efficiency A, C, B and D; at 70 units of input, they rank C, A, B and D; at 90 units of inputs, they rank C, A, D, B. The productivities of course vary with the inputs and the efficiencies. Figure XXX compares similarly three different mixtures of feed, I, II and III fed to the same cow. The limit of increase in physical efficiency with Mixture I is at A; and it does not represent a very high efficiency of use. More of Mixture III will be consumed than of either I or II, but its relative efficiency is still lower. Mixture II has the most efficiency of any of the three.

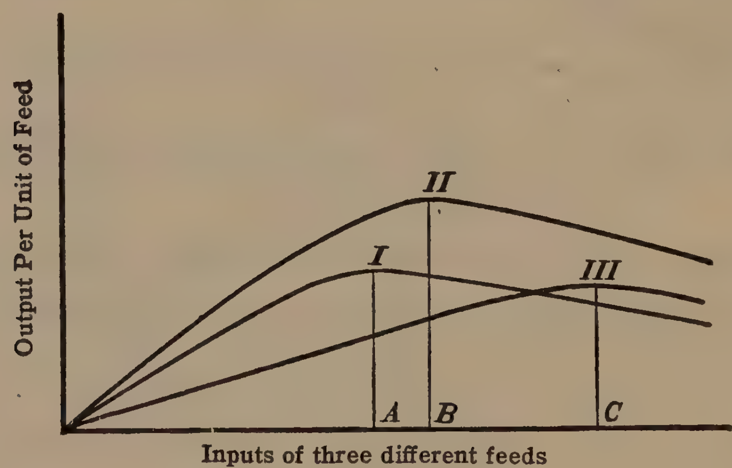


FIG. XXX. Physical Capacities and Efficiencies of Three Different Feeds for the Same Cow Compared.

The reason this last illustration is included is to show how the physical capacity and efficiency of any producing unit can be analyzed by taking a unit of it as fixed and varying the inputs of the other element, in the manner already explained in connection with productivity.

Although economic capacities and efficiencies of individual producing units can be compared in the abstract, since it is always understood in such cases that the types and quantities of the other elements combined with them are such as to give the highest-profit combination, it is advisable to indicate the type of the other element used in the combination. It is also entirely proper to use the terms economic capacity and efficiency even though the type of other element used may not be such as to give highest-profit combination as to type; but in such cases, the type of other element used must always be indicated.

As a matter of fact, merely designating the type is hardly sufficient. What one really needs to know is the *capacity* and *efficiency* of the other producing element. Each different capacity and efficiency of producing elements used in a combination will give its own series of capacities and efficiencies of the producing unit being analyzed. Mixture I in Figure XXX will give a different series of capacities and efficiencies for cows than will Mixture II or Mixture III.

In the case of physical efficiencies and capacities, it is *always* necessary to designate as definitely as possible the type of the other producing element. The physical capacity of a given piece of land will be different for nitrates than for phosphates or potash or lime. The capacity of a saw will be different for different kinds of wood; of a boiler for different kinds of coal. Some automobiles have high capacity for gasoline, others for cylinder oil, others for repair labor. Some business men have high capacity for selling, others for office supervision, others for factory supervision. Some live stock has high capacity for feed, other live stock for shelter, and still other live stock for labor; some land for moisture, some for cultivation, some for fertilizer. Just as the physical capacity of any producing unit is different for different elements, so is the physical efficiency. One machine may be efficient in its use of labor and space, but inefficient in its use of power and raw materials. Moreover, as with capacity, the efficiency of any producing unit varies according to the efficiency of the other elements used with it. A machine has one efficiency for highly efficient labor and another for inefficient labor; and the same for raw materials and power. In short, as with capacity, any unit of an element of production has as many efficiencies as there are different efficiencies of units of all the other elements that may be associated with it.

Productivity Rankings.—We are now in a position to understand better why gross product rectangles may be used as a basis for ranking the productivity of individual producing units. Let us consider physical productivity first. If physical capacity is measured at the maximum physical output per unit of input, extra capacity in a producing unit, efficiency being the same, increases the product exactly by multiplication. An extra capacity of 4 will increase the product by 4 *times* whatever is the output per unit of input. Efficiency being the same, therefore a unit of larger capacity cannot help having a larger gross product rectangle. The same is true of extra efficiency, capacity being the same. The size of the gross product rectangle will therefore increase or decrease as either capacity or efficiency change. Hence,

although the gross product rectangles do include the varying contributions to the product of the input element, they include them *in proportion to* the capacity and efficiency of the fixed element whose productivity is being measured. Gross products and the productivities of the fixed elements therefore rank the same.

The difficulty with using gross products as *measures* of comparative productivity of units of the fixed element arises from the multiplication above mentioned. Double both efficiency and capacity and the gross product is quadrupled. If gross product is used as a measure of productivity of elements, it accentuates the differences between different grades of them, showing them geometrically instead of arithmetically, by multiplication instead of addition. If, however, the logarithms of the gross products were compared in place of the products themselves, this effect would be eliminated (adding the logarithms of numbers is equivalent to multiplying the numbers themselves), and the result might be an approximation to the relative size of the contribution to the product of different units of the input elements.

If the foregoing is true for combination at the point of maximum physical efficiency, it must surely be true at the point of highest-profit combination, for the same multiplication relationship exists there as in other combinations. The profit rectangles increase and decrease in area by multiplication as the highest-profit point moves to the right or left for differences in economic capacity, and likewise as the altitude of the rectangle changes for differences in economic efficiency, or net output per unit of input, at this point.

The relation between prices and cost-rates would be very important in such a comparison. If prices were temporarily low relative to cost-rates, there might be only a slight margin of profit. This would decrease the absolute significance of differences in capacity and efficiency; but not the relative significance.

Productivity with Several Elements in Combination.—When two elements only are combined, it is easy to see how the efficiency and capacity of the one depends upon the efficiency and the capacity of the other, and how the productivity of the combination varies with all of them. Introduce a third element, however, and the capacity and efficiency of each element probably is affected by two additional capacities and efficiencies. Frequently the efficiency of a machine depends upon the efficiency of both factory and men; and the same with capacities. Power and raw materials raise the count still further. The output per machine under such circumstances is not the output of the

machine aided by a factory, but the output of the machine plus a portion of the factory, plus men, plus power, plus raw materials. The more elements combined in production, the larger the output per unit of any one of them—speaking graphically, the greater the altitude of the rectangle of productivity. Any curves of capacity and efficiency, such as those in Figure XXIX, drawn with three or more elements in combination, must therefore be interpreted very carefully. In the first place, the variations in the amounts of the third and fourth elements that accompany the variations in amounts of the one in question, will affect the net output per unit of the element in question, and also its capacity. For example, net outputs per machine will be different if the number of men per machine is increasing or decreasing along with the number of machines. In the second place, the efficiency of the third and fourth elements will affect the net output per unit of the second. There is, of course, nothing new about this—if the efficiency of any element varies with the efficiency of one other element combined with it, it surely ought to vary with the efficiency of any additional elements combined with it.

III. COMBINATIONS OF EFFICIENCIES

We are now ready to take up the real problem of the Chapter, namely, the *combination* of the grades of productivity of the elements of production. This combination might be worked out in terms of productivity as a whole; but it is better to analyze it in terms of capacity and efficiency separately, now that these concepts have been explained. We will take up the combination of efficiencies first.

The problem we are considering is of this nature: given 5 store locations whose efficiencies rank, let us say, from 5 down to 1, and 5 storekeepers whose efficiencies run from 5 down to 1, how shall they be combined? Shall the most efficient storekeeper have most efficient location? or the least efficient? or which? This question has sometimes been answered by arranging the efficiencies of the storekeepers and the store locations in two parallel columns in various orders and multiplying them together to see which arrangement of them gives the largest sum of products.[1] Thus if they are combined in the order of their efficiencies, most efficient with most efficient, and least efficient with least efficient, as in the following, the sum of the products would be 55; but if they are arranged in the reverse order, it is only 35. Intermediate combinations give sums of products between these extremes.

[1] H. C. Taylor, *Agricultural Economics*, 1905 Edition, p. 60.

No other possible combination gives a sum of products as large as the first one.

In order of efficiencies:	*In reverse order:*
$5 \times 5 = 25$	$5 \times 1 = 5$
$4 \times 4 = 16$	$4 \times 2 = 8$
$3 \times 3 = 9$	$3 \times 3 = 9$
$2 \times 2 = 4$	$2 \times 4 = 8$
$1 \times 1 = 1$	$1 \times 5 = 5$
55	35

Other arrangements:	
$5 \times 4 = 20$	$5 \times 2 = 10$
$4 \times 3 = 12$	$4 \times 3 = 12$
$3 \times 2 = 6$	$3 \times 4 = 12$
$2 \times 3 = 6$	$2 \times 5 = 10$
$1 \times 5 = 5$	$1 \times 1 = 1$
49	45

But can this be taken as proof as to which is the best arrangement? An affirmative answer to the question assumes a relationship of *multiplication* of the extra efficiencies of the more efficient storekeepers and locations. Does such a relationship exist? An effort to show that it does takes the following form: Efficiency by definition is output *per* unit. *Per* means division; and division and multiplication are merely two ways of looking at the same relationship. This is illustrated by Figure XXXI, in which 4 inputs of 3 different feeds are assumed to

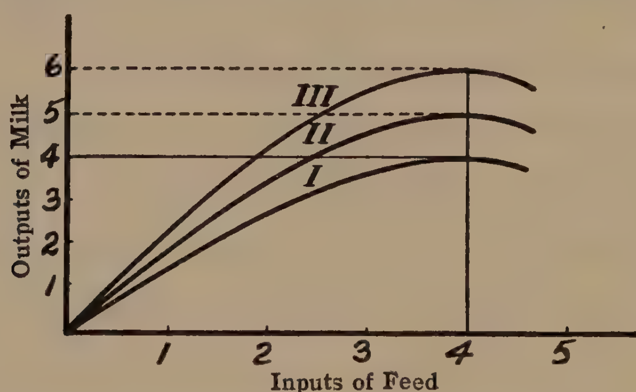


FIG. XXXI. The Effect on the Product of Feeding Three Grades of Feed to the Same Cow.

be fed to a cow. (For the sake of simplicity, gross in place of net efficiencies are represented in the diagram. They would be proportional to one another if they were both shown.) The least efficient feed gives a gross product of 16 (4 inputs $\times$ 4 outputs per unit of input); the next feed in order of efficiency gives a product of 20; and the next

24. Thus the extra efficiency of the feed in each case increases the effect of each unit of the feed—it increases the product by multiplication. Now assume as fixed a certain amount of the least efficient of the 3 feeds and use in order 3 cows of 3 different grades of efficiency. The second cow in order of efficiency would increase the product in exactly the same way as did the second feed, although probably not to the same extent. The extra efficiency of this cow would increase the effect of *each* of the 4 inputs of the feed—that is, it would increase the product by multiplication. The effects of these two procedures might be as follows:

Same cow—3 different feeds	*Same feed—3 different cows*
$4 \times 4 = 16$	$4 \times 4 = 16$
$4 \times 5 = 20$	$4 \times 7 = 28$
$4 \times 6 = 24$	$4 \times 10 = 40$

Now imagine these two increases in efficiency introduced simultaneously. The extra efficiency of the feed would make not only that amount of efficiency represented by the first grade of cow more productive, but the extra efficiency besides; that is, the two extra efficiencies would multiply into each other. This can be made clearer by the following simple algebraic presentation:

Let x = the efficiency of a given store location;
and y = the efficiency of a given storekeeper.
Then xy = the output.

Now assume a store location whose efficiency is $x + 1$ being used by this same storekeeper: the output will be—

$$\begin{array}{r} x + 1 \\ y \\ \hline xy + y \end{array}$$

The y is extra output. It results because the storekeeper had the 1 unit of extra efficiency in the store location to use.

If a $y + 1$ storekeeper were to use an x location, the output would be $xy + x$, the x resulting because the store location had 1 unit of extra efficiency in the storekeeper to use.

If the $x + 1$ store location and the $y + 1$ storekeeper are used together, the output will be

$$\begin{array}{r} x + 1 \\ y + 1 \\ \hline xy + y + x + 1 \end{array}$$

The output is greater not only by the x and the y, but by the 1 in addition. Not only does the extra efficiency of the store location multiply into the y, and the extra efficiency of the storekeeper multiply into the x, but *the two extra efficiencies multiply into each other*, giving us a further additional output of 1.

If the store location were as efficient as $x + 4$, and the storekeeper as efficient as $y + 4$, the output would be

$$\begin{array}{c} x + 4 \\ y + 4 \\ \hline xy + 4y + 4x + 16 \end{array}$$

Here the extra efficiencies of 4 multiply into each other.

And as above explained, there is no way of combining $x + 1$'s, $x + 2$'s, etc., with $y + 1$'s, $y + 2$'s, etc., which will give as large a sum of products of extra efficiencies as combining them in the order of their efficiencies. Figure XXXII shows these relationships graphically.

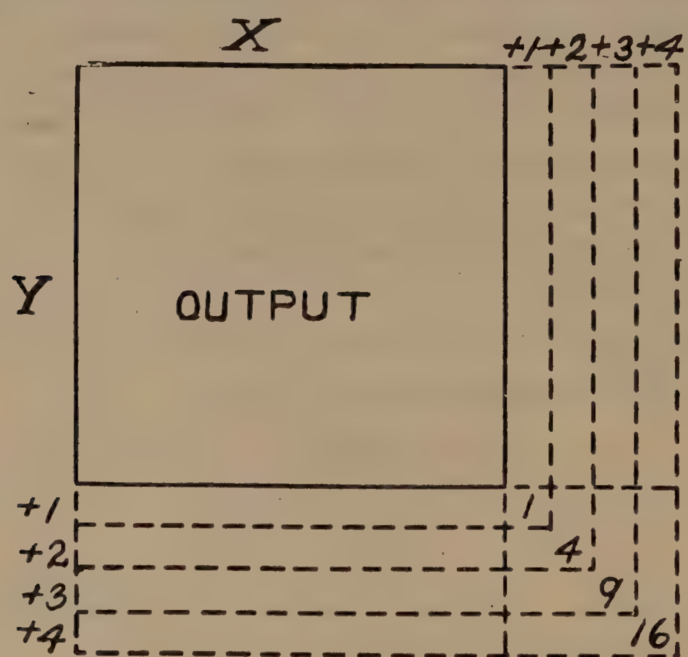


FIG. XXXII. The Combined Effect on the Output of the Extra Efficiencies of Two Units of Production Elements.

As the next step in the analysis, it is always pointed out that most individual persons are not interested very much in the sum of the products from all combinations, but rather in the profit they can make for themselves from some particular combination. What combination will pay the individual entrepreneur best? Obviously if the best grade of land could be rented for as little as the poorest grade, even the

poorest farmer would want to take the best grade. But unless there is some serious maladjustment of some kind the best grade always sells for so much more than the poorest grade that the poorest grade farmer cannot afford to rent it. If he did, he would lose heavily by so doing, for the chances are that its rent is set very largely by what the better grade of farmers can afford to pay for it. Thus if an $x + 2$ farmer attempted to rent a $y + 5$ farm, he would probably find that its rent was fixed at somewhere near what an $x + 5$ farmer could pay for it, at $xy + 5y + 5x + 25$, whereas all he could afford to pay for it would be $xy + 2y + 5x + 10$. If rents are properly adjusted to efficiencies, it also pays *individuals* to combine themselves with other production elements in the order of their efficiencies. The same statement is made with respect to all other production elements. It will be a mistake for an entrepreneur to use low-grade labor upon high-grade materials, or with high-grade machines; to feed low-grade feed to highly efficient cows; to put low-grade salesmen to selling a high-grade product. The principle of combination of grades of efficiencies is therefore a principle governing individual behavior as well as society at large, although in a somewhat different manner.

Whether or not and to what extent such a relationship as the foregoing does exist between grades of efficiency of different elements in combination, the author is not prepared to assert. The issue involved needs to be analyzed further in terms of actual economic experience. There seems to be a pronounced tendency for the most efficient equipment to use the most efficient labor and land. But there are also many exceptions to this. Well-to-do enterpreneurs are generally disposed to have the best whether it pays them to have it or not. They may have inherited their wealth, or come upon it by chance, or have accumulated it earlier while working in combinations perhaps more suited to their efficiencies. Entrepreneurs with limited means, on the other hand, are disposed to use cheap grades of production elements merely because they have not the means to buy or hire better. No doubt many entrepreneurs of high efficiency are using lower grades of production instruments than they should because they fail to appreciate the advantage to them of using better grades. But no doubt also many low-grade entrepreneurs are using higher-grade instruments than they should merely because they fail to appreciate the disadvantage to them of using such instruments.

To the extent that mal-combinations of this sort occur, the prices for the different grades of the production elements will be out of line.

No distinction has been made in the foregoing between economic and physical efficiency. If the objective is to obtain the largest possible physical product from a group of units of production elements, the combinations will be on the basis of grades of the units of each element in terms of physical output per unit of input. If the objective is the *largest net value* of product from the group, the combinations will be on the basis of the grade of the units of each element in terms of value of product per unit of input in the highest-profit combination. Both as individuals and as a society, we are really interested in the last analysis only in combinations in terms of economic efficiencies. If all combinations of efficiencies were made in terms of physical efficiencies, we would produce much more of some commodities than we need, and much less of others. Making combinations on the basis of economic efficiencies tends to keep prices and production and consumption of all commodities properly adjusted to each other.

If any grade or type of any element of production tends for a time to be used in combinations of too high or too low grade, its price will reflect this fact. This means in the first place that as long as the condition continues, society will not be getting its best utilization of the elements of production, and in the second place, that individual entrepreneurs may have a larger net product by going out of the grade in which they would belong under conditions of perfect adjustment. They may find the high grade which they would normally use overpriced; or the lower grades which they would normally not use underpriced.

Following are a number of the typical situations which are difficult to account for in terms of the foregoing explanation, and which raise a doubt as to its entire validity: a tract of sandy land has been farmed for many years by low-grade farmers until it will no longer support them, whereupon a highly efficient farmer purchases a large tract of it at a very low price and makes a high profit from it. There are several possible explanations of such a case. One is that although the highly efficient farmer made a high profit on this sandy land, he might make a still higher profit on higher-grade land. But this will not be a sufficient answer in all cases. Another answer is that the low-grade farmers were all farming too few acres, and making low net products in consequence, and that as a further consequence the land was all under-priced. Or it may be that the sandy land really is highly efficient in the use of management although inefficient in the use of labor, and that what is needed is a tract of land large enough to permit

the management of one farmer to be fully utilized. The net product from small farms is mostly return to the farmer's labor, in the use of which this land may be inefficient. Still another possible explanation is that the new farmer may practice a very different system of farming with a different combination of products and production elements. It is doubtful if it is proper to call all this merely an exhibition of more efficient management. The effect of differences in the product will be discussed later in the chapter.

But even these explanations may not account for some of the cases such as the foregoing. It is entirely possible that some low-grade land is efficient in the use of only high-grade management and high-grade labor, that it is virtually unproductive when used with low-grade management and labor. This means that the price of it is set by the competition of the high-grade managers only, and that this price is made such by market forces that it is as profitably farmed by such entrepreneurs as is the higher-grade land. This explanation reverts back to statements made earlier in the chapter that every grade of efficiency of any element of production has a different efficiency for every grade of another element. Combining grades of efficiency therefore requires first of all a separate ranking of each grade of any element for each grade of the other element with which it may be combined, and finding with which grade it has the highest net output. This suggests that after all it is only "fit" of efficiencies to each other than can be set up as a positive objective. It may well be, however, that in most cases the most efficient instruments of production get their highest net output when combined with the more efficient grades of the other instruments. The cases where this is not true are probably those in which efficiency in one element acts in a sense as a substitute for efficiency in the other.

A case similar to the foregoing is that of the combination of labor and low-grade and high-grade equipment. In some cases, a highly efficient worker may obtain a larger net output for himself by using a low-priced inefficient machine, whereas a low-grade worker could get no product out of it at all. A high-grade machine may be so foolproof that it needs only low-grade labor to operate it. Using second-hand crippled machinery rather than new machinery may be good economy in some cases, partly because of the foregoing, and partly because the operator of it has much spare time available for keeping it in running order.

Another interesting case is illustrated in many small establishments.

On a farm worked by a man and a boy, the boy may use the better team and perform many of the important functions. This is because the margin between the boy's efficiencies in the use of the two teams is much greater than that between the man's efficiencies in their use. The boy may not be able to use the poor team at all.

Some of the difficult situations to explain no doubt arise from the fact that rankings in economic efficiencies may not be the same as rankings in physical efficiencies. If the two grades of fixed elements used in a combination have the same capacity, and likewise the two grades of the input elements, the rankings of each will be the same regardless of changes in prices or cost-rates. Figure XXXIII shows a

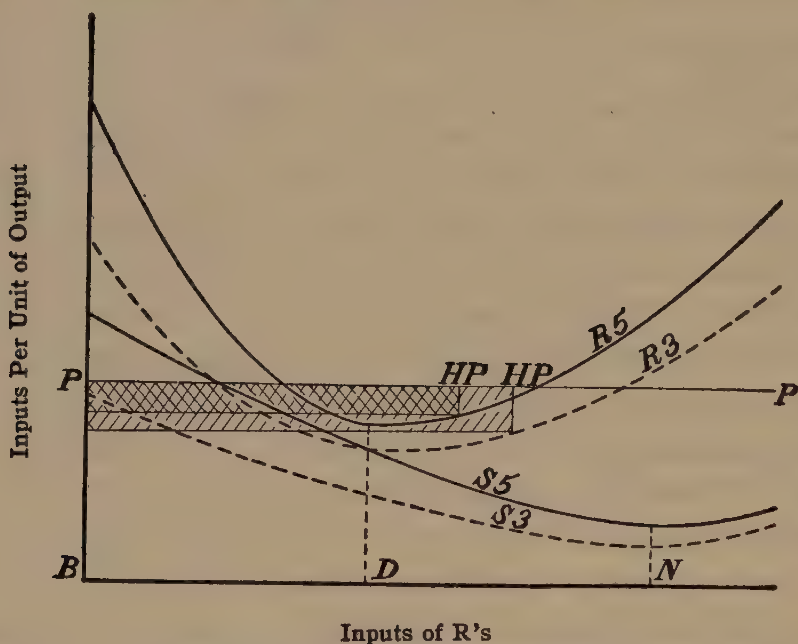


Fig. XXXIII. Combinations of Economic Efficiencies with Capacities the Same.

case of this kind. The capacity of both R_5 and R_3 for both S's is BD; the capacity of both S_5 and S_3 for both R's is BN. Whatever the selling price or cost-rates, the highest-profit combination for the two grades of R's and S's must come somewhere between D and N; and at any such point, R_3 is sure to have a higher net output than R_5; and so would R_4 or any other possible R in between.

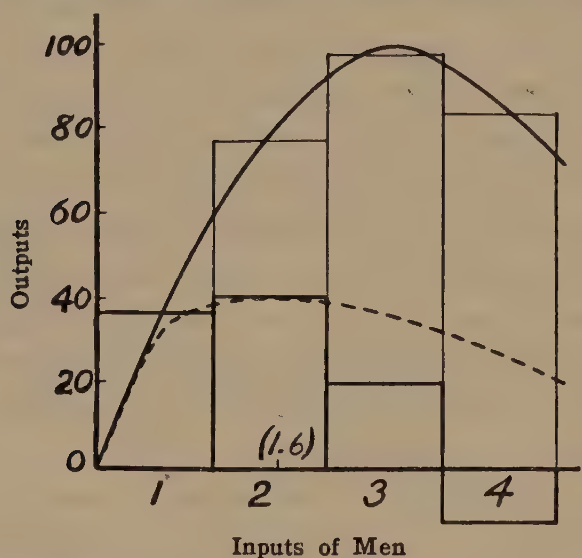
But if one grade of R had its capacity for S's at 3 inputs and the other at 5 inputs, then it might well turn out that a shift in prices or cost-rates in one direction would make one of the R's more efficient and a shift in the other direction would make the other R more efficient.

IV. COMBINATION OF CAPACITIES

From the standpoint of combination of capacities, the elements of production are of two types: namely, those which are highly divisible or come in very small units, like land, seed, fertilizer, feed, fuel, power, and most supplies; and those which come in units of appreciable size, like machines, buildings, laborers, and live stock. Any acre of land put to a given use has a definite physical capacity for labor or seed or fertilizer; but if more capacity is wanted than an acre represents, or less, then any fractional part of an acre can be added or subtracted. The problem of combination of capacities is relatively simple where all the elements are of this sort. When the quantity of fertilizer has been adjusted to a tract of land in such a way as to give highest-profit combination, then capacities have been properly fitted. The lower the capacity of a given amount of land for a given kind of fertilizer, the more acres of it that will have to be used with a given amount of it before the highest-profit combination is reached; and the lower the capacity of a certain amount of this fertilizer for a given kind of land, the less land that will give the highest-profit combination. Since the economic capacity and the economic efficiency are both measured at the same point of a highest-profit combination, *the combination which is best for efficiencies is also best for capacities*. The same analysis fits the case of combinations in which one of the elements is of the divisible sort and the other comes in units of considerable size—such combinations as a machine and raw materials, a cow and feed, a manager and land. As long as one of the elements is divisible, a perfect fit can always be arranged simply by taking the right amount of that element.

The difficult cases are those in which both elements come in large units. Given a producing unit of a certain capacity, the number of units that will be associated with it at maximum physical efficiency will depend upon the size or capacity of the units. A pasture with a certain capacity will feed more 800-pound animals at maximum efficiency than it will 1200-pound animals. A tractor of given horse power will pull more 12-inch plows than 14-inch plows. A factory of given dimensions will accommodate more 500-gallon vats than 800-gallon vats. A foreman of given capacity will supervise more small looms than large ones. On the other hand, a 40-horse power tractor will pull more of either 12-inch or 14-inch plows than will a 30-horse power tractor; and the same for factories and foremen. It really

makes no difference whatever whether the capacities of these producing units are low or high. All that is necessary is to get the right number of units of a given capacity of one element to go with a unit of a given capacity of another element—in other words, all that is needed is a "fit." This, of course, is where the difficulty comes, as has already become evident in several combinations illustrated in previous chapters. Eight men per machine may be a little too much labor; but seven men will make an even poorer fit. The high point in the curve of average output may be nearer seven men than nine men, or vice versa. Wherever units of two elements are nearly of the same size, this difficulty will be most serious. Thus a small store may be too large for one salesman and not large enough for two. A crew of



Additional outputs	36	40	20	−12
Total outputs	36 (64)	76	96	84
Average outputs	36 (40)	38	32	21

Fig. XXXIV. Combinations of Units of Similar Capacities: Machine Fixed, Number of Men Varying.

two may be too many for one drill, but one cannot work efficiently alone. Fitting the number of men and horses to a farm is also difficult. Another situation that frequently arises is that many producing units are so small that they cannot use efficiently even one unit of some elements. Thus many small country newspapers cannot afford one typesetting machine.

Before the analysis can be carried further, certain differences must be pointed out between the combining of physical and of economic capacities. The point A of maximum output per unit of input represents largest possible product from the varying input element, but not from the fixed element. It is impossible to secure largest

possible physical product for both the fixed and the varying elements at the same time. It is only when the input and the product are reduced to a value basis that it is possible to speak of largest output per unit of *both combined*, and the output is then *economic* output.

But there is a problem involved in getting the elements of the sort here in question combined merely at the point of largest output of one of them. Let us illustrate this by a case of men and a machine. Figure XXXIV shows the outputs resulting as 1, 2, 3 and 4 men are added in succession to one machine. With 1 man, the total output is 36, and likewise the output per man. With 2 men, the total output is 76, or 38 per man. With 3 men, the total output is 96, or 32 per man. One would say, looking at such a combination, that the capacity of the machine was 2 men and the maximum physical efficiency 38. But if it

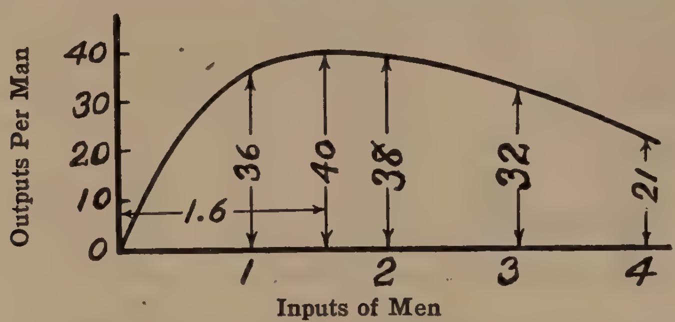


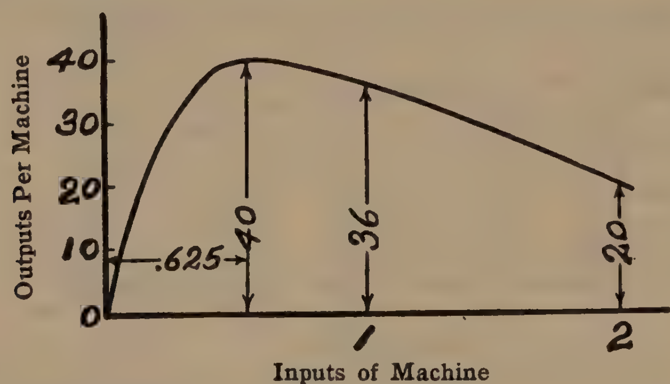
FIG. XXXV. Same Combination Assuming Men Added in Fractional Amounts.

were possible to add men in fractional amounts as in Figure XXXV, it would appear that the maximum efficiency is 40, and is obtained with 1.6 men. Thus 1 is too little, and 2 men are too much. All that can be said of 2 men, is that they are a better fit than 1 man. If the capacity of the machine for men is 1.6, then by simple calculation the capacity of men for machines is 0.625. Figure XXVI assumes 1 man and adds machines in fractional parts. At 1 machine, the output per unit of machine is 36, as in Figure XXV; at 0.625 of a machine, it is 40 — thus 0.625 is its capacity.

It will not therefore be possible to combine these particular men and machines in such a way as to permit either men or machines to be used at the point of maximum output per unit. If the machines had been one-fourth smaller, a better fit would have been attained with 1 man than with 2—but not a perfect fit. If the men had been one-fifth larger, the machine being the same, then 1.33 men would have given the best fit, and 1 man would have been better than 2, but neither would have been a good fit. The men that would fit perfectly

with the present machine would have to be either one-fifth smaller—with a capacity of 0.5 of a machine; or three-fifths larger—with a capacity of 1 machine. In order to secure maximum physical output from one of the elements, the physical capacities of the two elements must be such that maximum output per unit of the element in question comes at whole units of it.

Obviously the smaller the units of one element relative to the other, the better the fit that can be obtained. Given a plant with a capacity of 20 units of equipment, increasing the number of units from 19 to 20 or from 20 to 21 will make relatively little difference. Either adding another plow to, or taking a plow from, a tractor with a capacity of two plows, would make a very inefficient combination. The range



Total outputs	36	40
Output per unit of machine	36	20

FIG. XXXVI. Same Elements as in Preceding Figure, but Reversed.

in sizes of the units of an element, and the amount of difference in the sizes, are also very important. Usually it is feasible to make machines small enough for the smallest manufacturing unit; but frequently it is not. For example, a small creamery cannot use a refrigerating machine efficiently; and few are large enough to use by-product milk powder machines efficiently.

The foregoing presents merely the problem of combining capacities so to obtain the highest-output per unit of the elements taken one at a time. Only when cost-rates are applied to the several elements, and prices to the product, is it possible to combine them in such a way as to get highest output per unit of all elements combined. In Table XIX the data of Figure XXXIV are reduced to an input-per-unit-of-output basis, and costs are figured with three sets of cost-rates, A, B, and C, With the A rates, the least-cost combination, if men could be added in fractional quantities, would be about 2.2 men, as indicated in Figure XXXVII; at the B rates, with the price of machines doubled, the

least-cost combination would move rather near to 3 men, probably to 2. 7 men; and at the C rates, with the price of men doubled, it would move toward 1 man, probably to 1.7 men. Thus under the actual conditions of whole units of men applied at a time, it would pay to use 2 men with the A and C rates, and 3 men with the B rates. At the B rates, 3 men would be a *better fit* than 2. The explanation is merely in terms of cost-rates and least-cost combinations. To be complete it needs to be extended to include selling prices and highest-profit combinations. But this would introduce no new principles or method. If more than two elements were associated, the analysis would be the same. All that would happen would be that the economic capacity of the machines and men would be changed. If Figure XXXVII were drawn with a third element O with a lowest physical input, when used in combination with men and machines, at 4 men, the economic capacity of machines for men might be still further increased, depending upon the relative price of O's as well as of machines and men. One high-priced cost element often has an economic capacity for low-priced other elements that is far beyond the point of physical capacity. *Therefore the objective in combining capacities is to secure units of such size that they will if possible give a highest-profit combination with whole units of all the different elements in the combination.*

TABLE XIX. THE EFFECT ON CAPACITY OF CHANGING THE COST-RATES

Inputs of man	PHYSICAL INPUTS PER UNIT OF OUTPUT		COST PER UNIT OF OUTPUT WITH THREE SETS OF COST-RATES AS FOLLOWS—		
			A	B	C
	Machines	*Men*	*Machine $100 Men $100*	*Machine $200 Men $100*	*Machine $100 Men $200*
1.	.0278	.0278	$5.56	$8.34	$8.34
(1.6).	(.0156)	(.0250)	(4.06)	(5.82)	(8.56)
2.	.0132	.0263	*3.95*	5.27	*6.58*
3.	.0104	.0313	4.17	*5.21*	7.20
4.	.0119	.0476	5.95	7.14	10.71

It has been implicitly assumed thus far that prices are the same for different capacities. This is an unreasonable assumption. If the efficiencies of two units of an element were the same, one would expect their prices to be proportional to their capacities. There is no doubt a strong tendency for this to be the case. But exceptions to it will occur when there is a large supply available of a particular size

of a cost element that does not give a good fit with the existing sizes of other elements. Thus if a manufacturer foolishly puts too many large-size printing presses on the market, their prices would not be proportional to their economic capacities. Except for cases of this sort, prices will tend to rank in the same order as capacities, efficiencies being the same. This is not reasoning in a circle—it is merely recognizing that the prices of cost elements and their capacities are interrelated and react upon each other.

But although prices rank in the same general order as economic capacities, efficiencies assumed to be the same, it is not probable that they are very often exactly proportional to them. The principal reason for this is that many producers fail to combine the elements

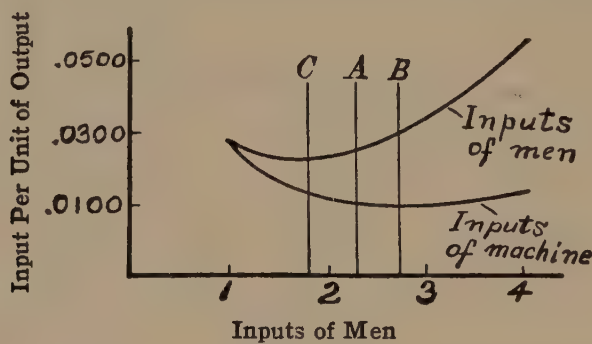


FIG. XXXVII. Combination of Economic Capacity (in terms of cost combinations only).

according to their capacities. The actual market prices for different grades of capacity are therefore like the market prices for different grades of efficiency, based on a large assortment of combinations of capacity, many at more than capacity, many at less, with all gradations between. The effect of this is that the differentials between grades of capacity are either more or less than they would be if all were combined at economic capacity. In striving for a least-cost combination of capacities, therefore, the producer finds that although a large-capacity unit costs more than a small one, it does not cost as much as it would if all combinations of capacity were ideal. He makes his combination, of course, in terms of the actual prices he has to pay.

It might at first appear from the foregoing discussion that combining grades of efficiency to secure least cost would dictate associating one set of units, and combining grades of capacity to secure least cost would dictate associating another set of units. It can easily be made clear that this is impossible. That which determined where between 1.6 men and 3 men the least-cost in Figure XXXVII would be located

with the different sets of cost-rates, was the shape and direction of the two curves of inputs—and these two curves are simply curves of efficiency reversed. In other words, the point of economic capacity depends upon the efficiencies of the two elements at different inputs. It thus appears that economic capacity and economic efficiency are determined at the same time for any unit of an element, that the two are simply functions of each other, economic capacity referring to the amount of the element that gives highest-profit when associated with others, and the economic efficiency to the output per unit of the other elements which give highest profit. That combination of efficiencies *which gives highest profit is at the same time and in addition the combination of grades of capacities which gives the best fit.* In our analysis, therefore, we come to exactly the same combination of any two or more elements as giving highest profit whether we approach from the standpoint of grades of efficiency or grades of capacity. Also we arrive at exactly the same conclusion for combinations of capacities for elements occurring in units of appreciable size, as we did at the beginning of this section for elements that are divisible. The only difference is in the quality of fit that it is possible to obtain.

V. THE EFFECT OF DIFFERENCES IN THE PRODUCT

Each type or grade of product has its own special needs in the matter of input elements. Different types of flours require different classes or grades or mixtures of wheat. Some crops need more rainfall than others, some more nitrogen than others. The efficiency and capacity of any producing element will therefore depend upon how well it is suited to the type of product sought. Our analysis of combinations must therefore be expanded to take in the product as well as the input elements. As a matter of fact, the product is fully as important a consideration as the input elements. We say of a certain type of leather that it makes good shoes for street wear, of another that it makes good shoes for evening wear, etc. These differences in the product and suitabilities of different input elements for different products make it difficult to compare two production processes resulting in different grades of products. Two modern flour mills will probably grind very nearly the same grade of flour from the same mixture of wheat. But this is certainly not so true of butter from the same cream, or cloth from the same yarn, or suits from the same cloth. Quality differences in the output are even more important in the case of service production, merchandising and the like, than in the case of

commodity production. In some cases, quality of service and quantity of service are so intermingled that they can hardly be separated—for example, the service of teaching.

If two units of a production element can be set to turning out exactly the same grade of product, and they are both equally well fitted to make this type or grade of product from the same raw material and supplies and with the same equipment, then their capacity and efficiency can be compared without difficulty. If one of them must work at a disadvantage, however, using the wrong raw materials and the like, to turn out such a grade of product, then obviously its true relative efficiency and capacity cannot be determined on this basis. It is obviously improper to determine the relative efficiency and capacity of two calculating machines, one primarily built for adding, and the other primarily built for multiplying, by putting both to work at either adding or multiplying. The relative efficiency of two tractors, one primarily built for plowing, and the other built for general farm work, cannot be judged on the basis of either alone. It is equally improper to judge the relative efficiency and capacity of two machines, or types of flour, or salesman, in terms of the same grade of product. But finding a method which does any better than this is often very difficult. One procedure is to reduce differences in grade of the product to a value basis, and express the efficiencies of the units being compared in economic units—such as dollar's worth of cloth per dollar's worth of yarn. This serves fairly well where only economic efficiencies and capacities need to be measured. Given two tailors using exactly the same materials, A turns out a suit which will sell for ten per cent more than B's, and does it in the same amount of time. We would surely say that A is more efficient than B in the use of cloth. But suppose A takes a half longer to do it? B's product per day's labor will sell for more than A's; but not B's product per yard of cloth. A highest-profit combination can be figured out for each, with A's product at the ten per cent higher selling price, and the economic efficiencies of the two compared in their respective highest-profit combinations. But it is doubtful whether relative efficiencies so determined are of much value in combining tailors with grades of cloth, grades of locations, etc. The two tailors really have different efficiencies for different grades of product, and a safer procedure is to get a separate set of efficiency indexes for each grade of product. This same statement applies to capacities also. One tailor has a high capacity for a low grade of product; the other has his highest capacity for a high grade of prod-

uct. It is doubtful if a comparison of their capacities for the same grade of product would be of much worth.

VI. THE RELATION OF CAPACITY AND EFFICIENCY TO COMPARATIVE ADVANTAGE

In Chapter V the principle was laid down that each person or area tends to do that thing which he or it can do at comparative advantage, and a preliminary attempt was made at explaining comparative advantage. It will be remembered that in a series of cases chosen for illustration, certain figures were assumed as expressing the relative advantage of different individuals or areas at different occupations or lines of production. It will now be apparent that these assumed figures were relative efficiencies; but the efficiencies were assumed to be measured under similar conditions, in fact, in combinations using the same amounts and kinds of the other factors. The analysis in this chapter puts the whole discussion of comparative advantage upon a secure basis. The methods outlined in this chapter show how the relative advantages of any area for the production of different products can be compared, and hence the ratios of advantages of different areas for different products; and similarly for different individuals and different occupations. The grades of efficiency of the different elements which are available for combination in different countries are important factors in determining their relative outputs per unit of input and hence their relative advantages in different lines of production.

Differences in capacities will have to be considered along with differences in efficiency. The difficulty was partly avoided in the earlier chapter by assuming the same inputs of the other elements. But producing units with different capacities cannot properly be compared in terms of the same inputs. It is now apparent that what should be compared is the productivity of the area or person for the different products, and of different areas or persons for the same product.

This leads to the question as to whether it is physical or economic productivity which is the basis of comparative advantage. The principle of comparative advantage as stated in Chapter V separates the physical from the economic considerations just as is done in this chapter. Advantage is first compared in a purely physical basis; then the factors of demand for the product and selling prices, and demand for and prices of the cost elements, are introduced as determining how

much of the productive energy of a given area will be devoted to a given line of production. The first is a comparison in terms of physical productivity; the latter in terms of economic productivity. In the real comparison, the areas or persons must be used not at their points of maximum physical efficiency, or capacity, but at the input in which they will be used under the conditions that are most likely to prevail in the different areas or places of work. For example, it is useless to figure Italy's comparative advantage in manufacturing assuming that coal will be used so as to give maximum physical efficiency for plant, equipment and labor. Similarly a change in the world's supply and demand conditions for wheat will affect the selling price and will cause different inputs of labor and fertilizer to give highest-profit combination. It is productivity with such inputs that must be compared. The grades of the elements likely to be available must be considered as well as the quantities of them.

SUGGESTIONS FOR FURTHER READING

For an additional treatment of certain phases of the subject discussed in this chapter, see H. C. Taylor's *Two Dimensions of Productivity*, Vol. VII, No. 1, Supplement to the *American Economic Review*, March, 1917, pp. 50 ff.; and Chapter XI of *The Outline of Agricultural Economics* (1925), by the same author. The whole subject is still in the early stages of its development, and the author wishes what is here presented to be understood as merely opening the subject for discussion. Some of the analysis here presented will undoubtedly be modified after further consideration.

PROBLEMS

1. What is the difference between physical productivity and economic productivity?
2. When you say that one machine is more productive than another, are you thinking of physical or economic productivity?
3. Can you speak of the physical productivity of any production element in general terms or must you designate the combination in which the element is used? Explain.
4. When a fixed amount of each of the fuels, A, B, C and D is burned in engines number 1, 2, 3, 4 and 5, the following outputs of horse power result:

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5
A	4	6	7	$6\frac{1}{2}$	$5\frac{1}{2}$
B	6	2	4	5	7
C	7	8	6	3	4
D	5	5	3	8	6

Apply the following cost-rates to the above data and locate the highest-profit combinations for each fuel: A, \$.80; B, \$.70; C, \$.90; D, \$1.00. Engine 1, \$.50; No. 2, \$.30; No. 3, \$.35; No. 4, \$.40; No. 5, \$.20. Selling price of product is \$.25 per unit of output. Which fuel has the greatest economic productivity?

5. If the cost-rates for the engine inputs were to change to \$.10, \$.40, \$.25, \$.50 and \$.35 respectively, would there be any change in the economic productivities of the various fuels?
6. Which is more difficult to measure, physical or economic productivity? Why?
7. If the point of highest average output is the best place to measure physical productivity, why is it not also the best place to measure economic productivity?
8. What elements enter economic productivity which are not considered in physical productivity?
9. Can anything be productive in a physical sense and not in an economic sense?
10. Two farmers each owning 320 acres of land barely made expenses. One sold 80 acres to the other one and now both are making satisfactory returns. Why should this be so? How did these men differ, in capacities or efficiencies?
11. In Figure XXXIII assume that the S curves represent machines and the R curves represent labor. Set up your own horizontal and vertical scales and prepare a table of inputs per unit of output for each of the four curves.
12. Assume that R_5 and R_3 are of equal cost and S_5 and S_3 are of equal cost. Apply these cost-rates to the table prepared in No. 11. Calculate a combined cost table for each combination, *i. e.*, $R_5 + S_5$, $R_5 + S_3$, $R_3 + S_5$, $R_3 + S_3$.
13. In Problem 12, locate the least-cost combination for each combination. Which combination has the least combined cost? Why?
14. If R_5 cost 25 per cent less than R_3, and S_5 cost 25 per cent less than S_3, which combination would give the least combined cost?
15. X left Iowa because of the high rents and moved to Canada where rents are much lower. How did X compare with his neighbors in Iowa in capacity and efficiency, or both?
16. In a city some business men are constantly moving into larger stores in higher-rent districts while others are moving away from the high-rent districts to the cheaper districts. Does capacity and efficiency give any clue as to the reasons for such changes?
17. One factory sells its machines to another plant making the same product and replaces them by new machines. Comment upon this in the light of what you have learned about capacities and efficiencies and their combination.
18. A bank cashier is discharged from a small country bank for "inefficiency," but gets a job with a large metropolitan bank where he is promoted rapidly because of his "efficiency." Explain.

19. Is the hiring of men of high efficiency equivalent to hiring more men? Is the hiring of men of high capacity equivalent to hiring more men?
20. It is sometimes said that if prices of production elements exactly represented differences in efficiencies, one might as well buy a poor one as a good one. Is this correct? What is a perfect "fit" of capacities?
21. Do inventions affect economic efficiency or economic capacity of old machines? How?
22. Most machinery sold is advertised as having a certain capacity and efficiency. Is this a physical or economic concept?
23. If the machines in Figure XXXIV had been one-half larger, what would have been their capacity in terms of whole men? What would have been the capacity of men in terms of whole machines?
24. The same in terms of fractional men and machines, as in Figures XXXV and XXXVI.
25. With machines at $100 and men at $300, determine the economic capacity of machines and men in Number 23 above.
26. When people say governmental operation is inefficient, do they mean that the government uses the wrong combination of elements as to goods, proportions, or what?
27. In fattening hogs, the length of time used depends upon the relation of the price of pork to the price of corn. In this case, which has the greatest influence on the highest profit-combination, the selling price of the product or the cost?
28. Under what conditions would the proportion in which elements are combined be of more importance than the quality or grade of the elements? Vice versa? Illustrate each.
29. Is labor in the Orient more or less efficient than labor in the United States? Economically or physically?
30. Should the comparative advantage of countries be measured in terms of physical or economic productivity? Why?
31. In what way will the analysis of comparative advantage differ when the capacities and efficiencies of the elements available are considered?

CHAPTER XIV

CAPITAL GOODS IN PRODUCTION

The production process, it will be recalled, has four phases: conversion of human energy, depreciation, form-losing, and appreciation. In most ordinary production processes, there are four elements or groups of elements, as follows: the active agent, the worker; the subject element, the material worked upon; the tools or machines and the like worked with; and the materials used up. These four groups of elements were expanded by subdivision into sixteen in Chapter II. In this and two succeeding chapters, these sixteen classes of elements are recombined into three groups, Capital Goods, Land, and the Human Agent, on the basis of certain common characteristics and their behavior in the processes of production. The group of elements considered in this chapter are those commonly called Capital Goods, conventionally defined as products of past effort of aid in further production. The following production elements will be considered in the order named:

Equipment—tools, machines, etc.
Buildings.
Land Reconstructions—roads, tunnels, canals, ditches, etc.
Land Fixtures—telegraph lines, railway tracks, fences, bridges.
Goods-in-Process.
Supplies—fuel, feed, paper, twine, etc.
Workstock—horses.
Productive Live Stock—dairy cows, etc.
Breeding Stock.
Growing Stock—meat animals.
Growing Crops.
Organization.
Money.

I. CHARACTERISTICS OF THE DIFFERENT FORMS OF CAPITAL GOODS

The only general statements that are significant from the point of view of production that can be made about all of these taken together are as follows: (1) All of them are goods upon which some

work has already been done—all of them have incorporated in them some human energy, or land, or raw materials, as a result of having been the subject-element or the product of an earlier production process. All of them are therefore participants in the roundabout type of production. (2) It is commonly said that all capital goods *depreciate* in use. This statement is true for some capital goods only with qualifications so important as practically to negative it—as in the case of growing live stock.

1. *Equipment—Machines as an Example*

Let us take up equipment for analysis first. Much of the analysis for equipment applies to other forms of capital goods. Equipment is a general name for a class of capital goods including tools, machines, vehicles, vessels and containers, furniture and fixtures, boilers, furnaces, etc. The term "tools" commonly refers to small items of equipment used almost altogether with the hands, and freely movable. Machines are of three sorts: those generating power, like engines and motors; those operating under power supplied to them, like lathes and flour milling machinery; and those which, like steam shovels, provide their own power. Some machines are quite stationary, like printing presses; some are movable, like threshing machines; others move under their own power, like traction engines, and others are designed primarily for hauling, like locomotives. Vehicles are of two sorts, those which provide their own power, and those which do not. Some fixtures are so nearly identified with the building itself that they are more properly classified as building than as fixtures.

The machine will be taken as the first example of the equipment type of capital goods. Most of the analysis for it applies to other types of equipment. A machine represents a certain amount of latent productivity; that is, in the remainder of its life, it is capable of contributing a certain amount to the product. The latent productivity of any machine, other things being the same, is less than it was before the use. Some of the machine has been taken away, changed in form, and become part of the product. Hence all machines depreciate right from the start.

This does not mean that the machine is less productive in each succeeding act of production, that is, that it decreases in efficiency and capacity. As a matter of fact, its efficiency and capacity in any act of production are often greater after the machine is worn a little than when it is entirely new. To depreciate does not therefore mean

to diminish in productivity so far as particular acts of production are concerned; it means to release some latent productivity.

Depreciation really is a value concept. In the last analysis, it is the value that the machine loses that really measures its depreciation. But at the basis of most value depreciation is physical depreciation. This can be illustrated as follows: Let us assume a machine that will last ten seasons. Let us assume further for the sake of simplicity that it is equally productive each of the ten seasons. This means that one-tenth of the machine is used up each season. At the beginning of the seventh season, there will be four seasons' use of it still available. Now let us assume a price or cost-rate for a season's use—say $10. Four seasons' use then will be worth $40, which will be approximately the value of the machine at the beginning of the seventh season.[1] If the cost-rate for a year's use was $8 instead of $10, the value at the same period of use would be $32 in place of $40. Now it sometimes happens that after a machine has been used for a time, because of a change in demand for the product, or for some other reason, the price or cost-rate for a year's use of it changes. Then immediately the value of the machine changes. Suppose the machine was worth $100 new, then $90 after a year's use, then $80 after the second; and then cost-rates rose to $12 for a year's use. The machine would at once rise in value to $96—8 years at $12 per year. Now suppose that after four more years, the cost-rates fall to $8—the machine would fall in value from $48 to $32. Thus as the price or cost-rate changes, the value of the rest of the machine changes. And, likewise, the amount of each season's depreciation; and the total depreciation since the beginning. Sometimes a new machine is invented which is much better than the old—then the value of a year's use of the old machine may sink to a very low figure indeed.

But the physical basis of depreciation must not be overlooked. If the machine lasted 15 years in place of 10, at the same $10 cost-rate it would be worth $90 at the beginning of the seventh season in place of $40. It is the physics of the machine that determines how long it will last—at what rate metal is worn from its bearings, at what rate its joints are loosened, at what rate its axles and springs fatigue and weaken under the strains of use.

As a matter of fact, a machine probably is not equally productive each season—even assuming the same amount of use. The first

[1] Actually it will be something less than $40, because $10 worth of use two or three or four years hence is not worth quite $10 now.

year it may require a good deal of adjusting and thus return a somewhat low output per unit of labor; or because it is stiff, return a low output per unit of power input. Later on, it may have to be stopped for repairs occasionally, wasting still more labor. Or it may spoil more or less raw material in process; or turn out a less perfect product. Hence different year's uses have different values. Depreciation is frequently determined by what is known as the *straight-line* method, that is, dividing the value of the machine by its life, which gives a uniform amount for each year. Obviously this is an inaccurate method in many cases. An accurate method would require that the amount charged off for each year's use be proportional to its loss in potential productivity during that year's use. Charging at the same rate for each year makes machine costs too high in the later years when the machine is about worn out; and too low in earlier years.

Repairs.—All parts of a machine do not wear out at the same rate. This is the occasion for *repairs* and *renewals*. A renewal represents a replacement of a part which wore out sooner than the machine as a whole. One method of charging off renewals would be to distribute the cost of both the old part and the new part each over the period during which it lasted. But the new part may not be worn out when the rest of the machine is. And the new part will always have a partly worn-out machine to work with. Hence a better method would distribute the total cost of all renewals over the whole life of the machine. This could be done, however, only by estimating the total renewals in advance at the time the machine first went into use. The same analysis applies to repairs, which are essentially no different from renewals. Included with the cost of repairs and renewals is the labor involved in making them, which is frequently the most important part of the whole.

Obsolescence.—One form of depreciation is called *obsolescence*. It consists of depreciation arising from a decline in the values of the future uses of goods due to development of better ones, decline in demand for the product, etc. Every improvement in a type of machine makes the old machines less valuable because it lowers the values of all of their future uses. A falling off in the demand for a product may have the same effect. Thus the invention of the tungsten-filament incandescent lamp made all the machines for making carbon-filament lamps almost valueless. Or sometimes demand will increase and make machines temporarily more valuable, in which case the opposite of obsolescence takes place.

Supplies.—Most machines also use more or less of certain types of supplies such as fuel, oil, chemicals, drill points, cutting surfaces, etc. The fuel used by a power machine, however, is in some respects like the "materials worked upon" of other types of machines—like the paper used in a printing press, or the buttons used in a shoe-buttoning machine. There is this important difference, however, that the fuel loses its form completely, whereas the paper and the buttons retain their form and appreciate. This is sometimes a difficult distinction to make, as in the case of machines turning out chemical products. The butter-making process is a good one to analyze from this point of view. The cream is the material worked upon; the salt and butter color are supplies and also the water and washing powder used in washing out the churn, and the oil used in its bearings. But the first supplies mentioned, salt and butter color, actually enter into the substance of the product, whereas the others do not. A more difficult case is that of bread. The milk, sugar, salt and yeast that are used along with the flour in making bread are so large a part of the loaf of bread that to class them as supplies seems a little preposterous. Yet to class them all as materials worked upon also seems a little preposterous. The water used in an ice-manufacturing machine is clearly material worked upon; the ammonia that is the actual freezing agent is clearly in the class of supplies. Such supplies as drill points and cutting surfaces are really minor repairs and renewals.

The importance of these distinctions will be more apparent presently when we get to talking about machine inputs and material inputs. The supplies used by a machine are generally considered as part of the machine input.

Maintenance Labor.—Of the labor which is used with machines, some may be said to work not with them, but upon them. That is, there is frequently a considerable amount of labor involved simply in keeping machines in running order, in such work as oiling, cleaning, filing, sharpening, adjusting, etc. Such labor is properly classified as machine input under the head of *maintenance* or *upkeep* labor. It is in addition to the labor used in making repairs and renewals, which was included with this item above.

Interest.—Another item that is generally considered as part of machine input is *interest*. All the while that the machine is being used up, an investment is tied up in it. If the process were carried on without the machine, the same funds could be put to other uses, or even

loaned out at prevailing rates of interest.[1] The investment tied up in a machine, however, is different at different stages of depreciation. Should the interest item then decrease as the machine depreciates? Obviously not, for the reason that the whole investment was necessary at the beginning in order to make possible a part investment later. It is not possible to manufacture half-worn-out machines.[2] This conclusion is further reinforced by the fact that if a machine were rented a year at a time, the rent while it was nearly new would reflect only its greater productivity at that stage, and not the greater investment tied up in it; and its rent later would reflect only its lessened productivity then, and not the decreased investment. Equally obviously, it would not do to reckon the investment throughout the period of its use on the basis of the investment at the beginning. At any time after the start, some part of the machine has been used up, and has gone into the product, which product has been sold, so that that part of the investment has been recovered. At the end of the first year, assuming a \$100 machine lasting 10 years, only \$90 is still invested in it; at the end of the second, only \$80, etc. The average investment *during* the first year is roughly $\frac{\$100 + \$90 = \$95}{2}$; during the second year $\frac{\$90 + \$80 = \$85}{2}$. On this basis, the average investment for the whole period of use of the machine would be as follows:

$$\frac{\$95+\$85+\$75+\$65+\$55+\$45+\$35+\$25+\$15+\$5}{10} = \$50;$$

and interest would be reckoned on a \$50 investment each year. At the end of the period, approximately the same interest will have been paid as if the investment had been considered as \$100 the first year, \$90 the second, and so on to \$10 the last year, and it will have been distributed equally over the whole life of the machine.

Insurance and Taxes.—These two remaining items of machine input should be handled upon the same basis as interest. In deciding

[1] Later in his study of economics, the student will find discussed the question as to whether or not "interest is a cost," and in what sense it is a "cost." If it is not considered as a cost, then it must be included with management. Least-cost combinations can be determined either including or not including interest as an element of cost; but it is simpler on the whole to include it as a cost along with capital goods separate from management.

[2] Of course it is frequently possible to buy them; but somebody else had to stand for a full investment at the beginning, which fact is probably reckoned in the price paid for the used machine.

whether to use a machine or not, a manufacturer figures on the basis of the average property taxes[1] and insurance he will have to pay over the whole period of its use, rather than upon what he has to pay any one year. Property taxes are supposed to be levied upon the basis of actual values of properties at the time of assessment. This means more taxes upon a new machine than upon an old one. But the machine had to be new sometime. Hence the proper basis is to even out the tax burden over the early and late uses of the machines just as has been suggested for interest. The same analysis applies to insurance.

Machine Inputs.—We have named seven items which make up machine input: depreciation, repairs and renewals, supplies, maintenance labor, interest, taxes and insurance. In common practice the terms *maintenance* or *upkeep* are used to include repairs and renewals, maintenance labor, and supplies like oil and drill points that are closely associated with the machines. For some purposes, it is convenient to use this grouping; for others not.

In computing least-cost and highest-profit combination in the preceding chapters, we combined machines with the other elements of production on the basis of their annual cost-rates. When a machine is rented by the year, then such annual cost-rates can be determined with little difficulty. The annual rents paid include most of the above items of input, and those which are not can be added. But most machines are not rented, but are purchased outright by those using them. This means that there must be some way of reducing their use to an annual basis. That way is to combine all the input items above named. The machine input per unit of output in a production process is not really so many machines, or such a fractional part of a machine, as indicated in Figure X, but a certain amount of depreciation, plus a certain amount of repairs and renewals, supplies, maintenance labor, interest, taxes and insurance. The depreciation input is actually a certain physical part of the machine which is used up. In effect, so is the repair and renewal input and the supplies input. These physical amounts of input times proper cost-rates give input in terms of cost. The output per year divided into the cost per year so determined gives the cost per unit of output.

The foregoing statement is in terms of year inputs; any other period could be used as well—a quarter, a month, or a day. A year is the

[1] The question as to whether taxes are costs or not is even more pertinent than the same question as to interest. There is no question as to insurance, however.

most convenient period for most purposes; where production varies from season to season, it is almost necessary to use a year as a basis.

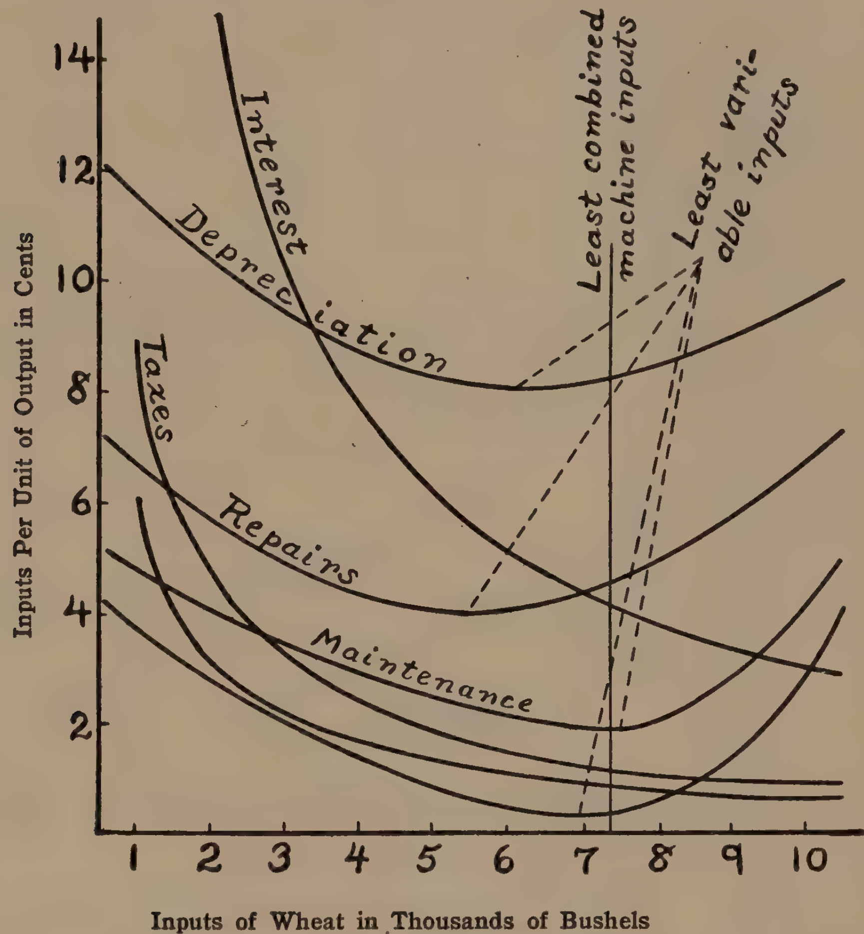
Variable and Fixed Inputs.—There are, however, serious difficulties in the way of making this combination of machine inputs. The different machine inputs do not all vary at the same rate or proportionally with inputs of other elements; for example, as more raw material is put through the machine, depreciation and maintenance labor may not be increased at the same rate. And none of them is increased in strict proportion to input of raw materials; for example, depreciation probably does not double as the churn-load is doubled. And interest, taxes, and insurance are the same whether the machine is run light or heavy. To inputs of the first sort, which vary with the input of raw materials, the term *variable* is applied. To those of the second sort, which do not vary with other inputs, the term *fixed* is applied. In any least-cost analysis, it is necessary either to treat variable and fixed inputs separately, or else to combine them into a machine input entirely in cost terms. But this latter procedure does not make it possible to compute machine input in physical terms and then apply a cost-rate per unit of physical input.

Each separate fixed and variable input presents a similar problem of its own. As for depreciation alone, it can be said that at a given input, each unit of output uses up a certain fractional part of the machine; and at another input, another fractional part. Likewise it can be said for insurance that each unit of output uses up a fractional part of the insurance. But the fractional parts for depreciation and for insurance are different, and vary at different rates. These fractional parts cannot be added—one is of the machine, the other of insurance on the machine and expressed in dollars. It is true that if a cost-rate is applied to the former, the two can be added. But it is safer to keep them separate throughout, treating them as if they were separate elements, as one would labor and materials.

The same objection applies, although less seriously, to combining depreciation, supplies, maintenance labor, and repairs and renewals, in any case where they vary at appreciably different rates.

Figure XXXVIII illustrates this problem in terms of a flour-milling machine. The figures are purely hypothetical. The inputs have all been expressed upon a value basis so that they can be combined. The three fixed expenses total 4.50 cents per unit of input at 1000 bushels of input; but only 0.45 cents at 10,000 bushels of input. The sum of these inputs is $45, whether 1000 or 10,000 bushels of

wheat are ground. The four variable expenses total varying amounts from 1.45 cents to 2.53 cents per 1000 bushels, being lowest at 6750 bushels of wheat input. But the different variable inputs vary at different rates and have different least-input points. The accurate



Total variable inputs	2.53	2.14	1.85	1.64	1.52	1.45	1.52	1.68	2.05	2.48
Total fixed inputs	4.50	2.25	1.50	1.13	.90	.75	.65	.57	.50	.45
Total machine inputs	7.03	4.39	3.35	2.77	2.42	2.20	2.17	2.25	2.55	2.93

Fig. XXXVIII. Least-cost Combination of Machine Inputs, a Flour-milling Machine Taken as an Example.

procedure would therefore be to consider each of the variable items as a separate input element, the same as labor and land, and have nine curves in Figure XXXIX in place of the six. However, for many purposes it is sufficient to combine all the variable machine inputs into one item as has here been done. The fixed machine inputs can all be combined in any case.

It will be apparent that the fixed inputs are a smaller proportion of the total inputs as the input of wheat increases; also that at the

point of least machine input, depreciation and repairs are somewhat higher than at a somewhat smaller input of wheat. The saving in fixed inputs, however, more than offsets the higher depreciation and repairs. Thus by using up a machine rather rapidly, one may at times actually reduce his per-unit costs. It often happens that

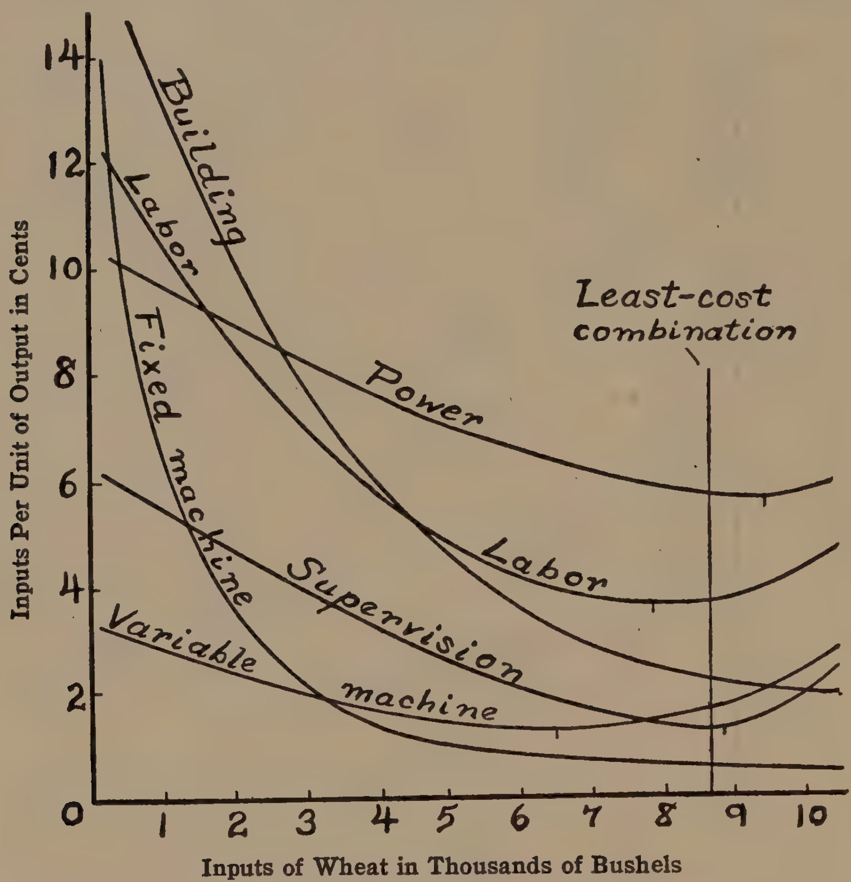


FIG. XXXIX. Least-cost Combination of Machine and Other Inputs.

those who use their automobiles very little have higher costs per unit than those who use theirs a great deal.

Power.—One other element of production, namely, power, is sometimes for certain purposes classified as machine input. If the power consumed by a machine were the same regardless of the input of raw materials and labor, considering it as machine input would be a proper procedure; but otherwise not; and obviously with most machines, the otherwise is the case. A churn with a load of 1000 pounds of butterfat uses more power than one with a load of 500 pounds (see Figure XX). To determine least-combination in such circumstances requires that power inputs be considered separately from machine inputs. Another difficulty is that power inputs are not proportional to the size of the machine. This will be discussed later.

Although a churn will require more power under a 1000-pound load than under a 500-pound load, it will not require twice as much. This is because some power is required to run the churn empty. Up to a certain point, therefore, there is a saving in loading more heavily.

Space.—*Space* or *shelter* also varies somewhat with input. The more raw material put through the machine, the more the work-space required around the machine, because of extra labor required, and in some cases because of extra storage space around it for materials and product. Also the larger the machine the more space it occupies and the more work-space it requires; but the required space will not vary proportionally with its size.

Man-labor similarly will not be proportional to input of raw materials. The same will be true of *horse-labor* used with machines. *Supervision* in practice often approaches closely to a fixed input.

Fixed Depreciation.—Many machines depreciate when standing idle. This is especially true of those which are exposed to the weather a good deal, like farm machinery. Depreciation which is proportional to time is a fixed input the same as insurance, and should be combined with the other fixed inputs. That special form of depreciation which is called obsolescence is also a fixed input—it is the same whether the machine is standing idle or in use.

Calculating Fixed Inputs.—Interest input, as already explained, can be calculated roughly by applying the proper cost-rate to half the value of the machine new.[1] One therefore does not need to know the life of the machine in advance. It is like getting the average width of a board which runs uniformly to a point at one end—the only dimension needed is the large end. The same is true of taxes and insurance. As for fixed depreciation, however, one must know, or be able to estimate, what the life of the machine would be standing idle. The same is true for obsolescence. If a machine is due to become completely obsolescent in five years, and will last more than five in constant use, all depreciation is a fixed charge.

Variations in Capacity and Efficiency.—We have now reached the point where we can talk about variations in machines. In common talk, we speak of machines as varying in size, weight, capacity, efficiency, durability, ease of operation, power requirements, labor requirements, space requirements, repair requirements, supervision requirements, quality of product, uniformity of product, etc. In

[1] This procedure is disturbed whenever price levels change or values of future uses change; but this is a problem for other courses in economics.

Chapter XIII all differences such as the foregoing in elements of production were resolved into differences in capacity and efficiency in different combinations. The power consumed by a machine is obviously a matter of its capacity and efficiency in different combinations. No machine has a definite "power requirement." The total amount of power it consumes varies with a number of things, principally with the amount of material that is fed to it, and its condition of repair and upkeep; and likewise the power input per unit of output. There is, however, with any given input of materials, assuming the same conditions of upkeep, etc., a definite power input that gives maximum output per unit of power input—this measures the physical *capacity* of the machine for power at that input of materials. At another input of materials, there would be another physical capacity for power. Moreover, at a given set of cost-rates for machines, power, materials, labor, space, supplies and supervision, there will be a least-cost combination and also a highest-profit combination which includes a given amount of power input—this latter measures the economic capacity of the machine for power. At another set of cost-rates, this economic capacity would be different. But not only is the amount of power which gives maximum average output significant, but also the amount of the output per unit of input—in other words the physical efficiency of the machine for power; and likewise the economic efficiency of the machine for power—or the cost of power per unit of output in the least-cost and highest-profit combinations above described. A full and accurate statement of the "power requirements" of a machine, to use the common expression, must therefore be rather involved. It should be made in terms of the capacity and efficiency of the machine for power under different sets of circumstances, such as inputs of other materials, cost-rates, etc.

Labor requirements likewise vary with other inputs, especially of materials, power, and conditions of upkeep. A machine has a certain physical capacity and efficiency for labor, other elements being the same; and also a certain economic capacity depending upon the least-cost and highest-profit combinations. Machines vary greatly in the amount of labor used to operate them most advantageously; also in the amount of maintenance labor. These two classes of labor should in most cases be considered separately. The same analysis applies to supervision labor, space, and supplies.

As previously suggested, the capacity and efficiency of a machine at any given time, or for any single act of production, and its capacity

and efficiency for the whole period of its use, are two different things, although closely related. In determining the least-cost combination at any given time, of course capacity and efficiency at the time is what must be considered. In organizing a factory for production over a period, however, one should consider *average* capacity and efficiency for the period.

As for quality of product, this, as has already been explained, is a problem of output. Two outputs or two inputs per unit of output cannot be compared except in terms of the same quality of product, and even this will not do unless they are equally well suited to the making of this quality of output.

The principles relating to combinations of capacities and grades of efficiencies work out in an interesting way in the case of machines. There is no reason ordinarily why the makers of machines should not make them of such capacity that they will give a good fit with the other elements of production. And this is what they generally do. For example, a drill is either a one-man drill or a two-man drill. Most farm machinery is built for one, two, three or four horses. But some machines cannot possibly be built small enough for use in many combinations. Or it may not be practicable to build machines in too many sizes—it increases the cost of manufacture too much. Another difficulty is that the size of machine that gives a good fit for man-labor may not give a good fit for horse-labor or power. On the whole, however, machine capacities can be fairly well adjusted.

As for efficiencies, each manufacturer is striving constantly to make his machines more efficient, to make them turn out either more product per unit of input, or a better quality of product. In consequence, there may be very little differences in efficiencies between different makes of machines. Or if there are, those who buy them do not know it, and generally believe that they are buying the most efficient machine.

In some cases, the differences in efficiency are recognized, but also the differences in price. The buyer then believes that he is getting "the best machine for the money." There are circumstances in which a "cheap" machine is the best to buy, because it gives the lowest least-cost combination. This may be the case, for example, when obsolescence is likely to be a large item. The less the value of a machine when new, the lower the interest, taxes, insurance, fixed depreciation and obsolescence. These may much more than offset higher variable depreciation, repairs and maintenance labor, especially

if the machine is really used very little. But labor input, power input and supervision input in turn may be enough higher to offset the lower machine input. They are likely to be higher if the machine is used a great deal. Thus the determining whether to buy a "cheap" but less efficient machine, or higher-priced more efficient machine, is a rather complex problem involving depreciation, upkeep, obsolescence, amount of use, amount of difference in price, efficiency in the use of labor and power, and quality of product. Such an analysis has to be made wherever an intelligent selection is made of a vacuum cleaner, a washing machine, a typewriter, a lineotype machine, or an automobile. Quality of product is always of first importance. If there were no actual differences in economic situations demanding different efficiencies, there would not be so many types of machines manufactured. The automobile is an excellent proof of this statement.

The other principal choice available in grades of efficiency is the choice between new and used machines. The easiest way to obtain a less efficient machine is usually to buy a secondhand one. If there is prospect that a machine will be needed for a short period only, or will become obsolescent soon, it is often good economy to choose a secondhand machine.

Supply.— Another very important consideration with respect to machines as production elements is their supply. Most capital goods can be increased in supply almost indefinitely. The only limitations on the number of tractors that could ultimately be made available is the amount of coal and iron in the world. If a million were wanted in a month, there would of course be some difficulty; but given a little time to build the factories and get the labor together, and the million would be forthcoming. This same statement applies to any particular capacity or efficiency of machines.

Mobility.—The significance of mobility in production is its effect upon combinations of the elements and their use in new locations or new forms of production. If a printing press becomes too small for the work of one country plant, it can be loaded on a freight car and shipped to a place where it will serve; but this will involve considerable expense. A tractor can be moved from farm to farm with much less expense. A locomotive can be run on almost any full-gauge track in the United States. At the other extreme, a land improvement cannot be moved at all.

Capital goods are also sometimes classified as *free* and *specialized*, free capital goods being those which can readily be converted into new

uses. A supply of coal is a good example of this. A completely specialized type of capital good is a blast furnace for smelting iron. A building may be so specialized as to be of little use for any other purposes—for example, a grain elevator—or it may be easily adapted to other uses—for example, a store building. Specialization in capital goods is mostly a matter of degree. In general, most machines are highly specialized.

Power Machines.—The only special consideration involved in power machines, such as steam engines, gas engines, dynamos, and the like, is that their output is measured in units of power rather than in units of a commodity. The ordinary units of power are the horse power and horse power-hour, and the kilowatt and kilowatt-hour. The horse power-hour and kilowatt-hour take account of the time during which the power is exerted as well as the amount exerted at any given instant. It can also be said of most power machines that they vary greatly in efficiency from time to time according to their condition of upkeep—as every user of an automobile knows.

A machine which furnishes its own power is really a combination of two machines, and perhaps should be analyzed as two machines. In some cases, it may be the power part which is inefficient; in others, the part which turns out the final product.

2. *Other Equipment*

The analysis for machines fits other forms of equipment with very few qualifications or emendations. One principal capacity of a *vehicle* is measured in terms of the load it will carry. The other is measured in terms of the power exerted in pulling it—steam power, electrical power, horse power, etc. Third in importance is the roadbed, measured in terms of its variable and fixed expenses, depreciation, upkeep, interest, etc. Fourth in importance is the labor involved in guiding and directing the vehicle and loading and unloading it. The most likely unit of output is the product of amount carried times distance carried in a given unit of time—the ton-mile-hour, for example. Another unit of output might be value of materials after being transported; but this unit is not a very practical one. The efficiency of the vehicle in use of power is measured, using the first unit of output mentioned, in ton-mile-hours, or some similar unit, per horse power-hour or kilowatt-hour. Efficiency in terms of material transported is measured in ton-mile-hours per ton of the material transported. Efficiency in terms of roadbed is measured

in ton-mile-hours per unit of depreciation, maintenance, interest, insurance, etc. The input items of roadbeds will be considered in another section of the chapter. Vehicles which travel under their own power have their fuel, gasoline, or electrical energy for input in place of power direct. Or the power part of the machine may be analyzed as one machine, and the vehicle part of it as another. In a street-car system, this separation is virtually a physical fact. The least-cost combination will depend upon the cost-rates for power or fuel, labor, roadbed and supplies. The cost of the materials hauled should not be included unless product is measured in value of transported product.

The unit of output of a *boiler* is pounds of steam delivered to the engine in a given period of time. The inputs are fuel, water, supplies, labor and space, and the fixed and variable inputs of the boiler itself. Efficiency in use of fuel is frequently reduced to a high degree of accuracy in the form of output per thermal unit of heat in the coal.

The inputs of small articles of equipment like *tools*, *office furnishings* and the like are so small that they can frequently be ignored in determining the least-cost and highest-profit combinations.

3. *Buildings*

Buildings and equipment behave much alike in production processes. For example, they both depreciate right from the start. The most important differences are the following:

1. Renewals on many types of buildings are a rather important item—painting, roofing, etc.

2. Because of the long life of most buildings, they are somewhat more subject to obsolescence. On the other hand, they are not so likely to be replaced by new inventions.

3. The fixed inputs interest, insurance and taxes are generally a larger proportion of the total. Depreciation is relatively less because of the longer period of use.

4. Fixed depreciation is more important than variable depreciation. Being exposed to the weather, buildings depreciate whether in use or not.

5. One of the other elements associated with buildings is land or site. Output per unit of ground space depends upon the height of the building and intensity of use of the building.

6. The output of factory buildings is measured in the same way as the output of machines; the output of warehouse and cold storage

plants, in the enhanced value of the materials stored at the end of the storage period, or perhaps in some physical unit, such as the amount that comes out of storage at the end of the period, times the period for which it was carried. The difference between amount put into storage and amount taken out, and also any change in condition of the materials stored, will be factors determining the efficiency of the storage. The output of store buildings is measured in the enhanced value of the sold commodities, this enhanced value arising from the holding of the goods in stock, plus the providing of a place where they can be displayed.

7. The capacity of buildings depends mostly, but not altogether, upon their actual physical dimensions; shape, height above ground, convenience of arrangement and accessibility are also factors.

8. Efficiency does not decrease with use and age to such an extent as with machines. If an old building is less efficient than a new one, it is usually more because of obsolescence than because of depreciation—it was not efficient in the first place, or is no longer efficient under the changed conditions prevailing.

9. Buildings are far less mobile on the whole than equipment. Many cannot be moved at all, and others only at great expense. On the other hand, most of them are not so specialized in their use as most machines. Factory and store buildings can generally be overhauled and put to new uses. It frequently happens, however, that the location is no longer a valuable one, in which case the immobility of the building renders it almost valueless.

The most important of the foregoing differences relate to *mobility*, *fixed depreciation*, *large fixed inputs* and *obsolescence*. The difference in mobility is principally responsible for their being put in a different class from equipment.

4. Land Reconstructions

Some improvements made upon land behave almost exactly like nature's contributions to it—for example, clearing, leveling, fertilizing. Others behave more like buildings and equipment—such as roads, tunnels, canals, wells, ditches and drainage and irrigation systems in general. Mine shafts and workings also belong in this same class.

Take roads as an example. A road may wear out exactly like a machine. Use always depreciates it. Like a machine, it may not be so efficient when strictly new as later; but it depreciates from the very

first use. The principal difference between roads and machines is in the nature of their depreciation. A road can be more completely renewed than a machine or a building. It can be restored even though worn clear to a rut—although in such cases, the restoration may amount to almost complete rebuilding. In this respect, it is much like land. It differs from land in that it will completely depreciate, whereas land will not. Abandon a road, and ultimately it will be nothing but land. Thus in general it is proper to say of a road that it is "worn out"; of a piece of land, that it is "exhausted" or "used up."

Ditches and canals depreciate by filling up; tunnels, by the decaying or weakening of their supports; mine shafts by filling with water, etc.

Some of these go back to land quickly; others slowly.

From the standpoint of behavior in production, there are important differences between the different kinds of land reconstructions. The rate of depreciation of some of them, especially roads, canals and ditches, is very rapid; of others, such as tunnels, mine shafts, wells, very slow. The maintenance cost of some is high—for example, of roads, canals, ditches and most mine shafts; for others, small—for example, of wells and tunnels. Also there are great differences between different types of the same land reconstructions. A concrete road may have higher fixed inputs than a gravel road, but lower depreciation and upkeep costs. A closed ditch may have higher fixed inputs and lower depreciation; an open ditch, lower fixed inputs and higher variable inputs. It is generally assumed that improvements such as roads, tunnels, railroad rights-of-way and streets, will never become obsolescent; and hence that it is safe to plan on a long period of use. Under such circumstances, the low depreciation and maintenance of the more permanent types of improvements will generally more than offset the greater fixed inputs. Whether this is true or not, however, depends upon interest rates in part. Hence the supply of loanable funds may be a limiting factor in determining whether concrete or some cheaper type of construction will give least cost. A new country with loanable funds scarce may find that cheap construction is more economical.

The other elements used with the various types of land reconstructions, and the resulting outputs, vary greatly. For a road, the principal other elements are vehicles, power, materials transported, labor and land. The outputs are measured in the enhanced values of the commodities transported, or in ton-mile-hours or some similar unit. The most efficient road for vehicles, power and materials transported

is the one that offers the least resistance to movement over its surface. Obviously there is a vast range in efficiencies. The capacity of a road may be measured in terms of the amount of traffic that will give most advantageous use at a given time, or over its whole life. If a road is crowded too much at any time, traffic will be delayed, output will be reduced, and depreciation may be more than proportionately rapid.

The principal capacity of a ditch is for land—it is measured in the amount of land that it will drain at best advantage. The dimensions and fall of the ditch principally determine this.

The outstanding characteristic of all land reconstructions is their complete immobility. If traffic moves to other channels, the road is left behind. When a mine plays out, the shaft is fenced in and allowed to fill with water. In this respect, land reconstructions partake of the nature of land itself.

5. *Land Fixtures*

One stage further removed from land, and like buildings in most respects, is the class of capital goods here called *land fixtures*. It includes telephone and telegraph lines, fences, car tracks, sidewalks, bridges. Their principal distinguishing features are that they are generally associated with areas and distance; are definitely attached to the land; cannot ordinarily be moved, at least without complete reconstruction; and they do not provide space or shelter. They depreciate almost exactly like buildings, perhaps being somewhat more exposed to the weather, and have relatively higher fixed depreciation and other fixed inputs.

Obviously the line between Land Reconstructions and Land Fixtures is hard to draw. Roads, for example, may in some cases be better classified as Land Fixtures. It is here assumed that the railway roadbed is a Land Reconstruction, and that the track is a Land Fixture.

6. *Goods-in-Process*

A very considerable portion of the capital goods of society are in the class of goods-in-process at any particular time. Growing crops are goods-in-process. The wheat on its way to the mills, the flour on its way to the baker, the bread on its way to the household, as well as while in the actual processes of being manufactured and merchandised, are goods-in-process. In their early stages, goods-in-process are usually called materials.

The special characteristic of goods-in-process is that under normal conditions they are constantly appreciating in value by having new form, place, time or possession advantages added to them. This appreciation ordinarily continues up to the time when the actual consumption or utilization of the commodity begins.

With commodities of the perishable type, however, there may be an offsetting depreciation that more than equals the appreciation. Imagine that as a carload of strawberries moves to market, the weather unexpectedly turns much warmer. With every mile covered, the place advantage is greater; but the form advantage may be sinking fast.

Also if a mistake were made and the strawberries were shipped to a market already glutted, they would actually be depreciating in value while moving to this market. The same may be true if the demand for a commodity falls off while it is being held in storage. The mere physical act of transporting a commodity may not add any advantage—it may actually decrease it. Likewise the mere physical act of holding a good in storage may not add any time advantage. But one must be careful how he makes such a statement. If the commodity were all thrown upon the market at once in place of being held, its value might be even less. It is only when a commodity has less want-satisfying power after being held than it would have had if consumed or utilized earlier that its value has actually been decreased. In the aggregate a great deal of this negative time advantage is created in the world. The reason for this is that it is impossible to forecast future supplies. Who knows what the next crop of wheat will be in the southern hemisphere?

In most production analysis, goods-in-process will be considered as varying, and buildings, machines and the like will be taken as fixed elements. The output in such case will be the goods-in-process in their enhanced condition as they come from the process. From such an analysis we will be able to determine the capacity and efficiency of the machines and buildings and of the goods-in-process. Such an analysis will show differences in materials and in goods-in-process the same as in machines and buildings. A certain kind of wood used in making furniture will repay well the use of hand-polishing methods; another will pay best for machine treatment. One commodity will pay well for open storage and much air and light; another for close storage.

In calculating least-cost combinations involving goods-in-process,

inclusion must be made of the interest, taxes and insurance on the goods while in process. This is especially important for goods held in storage, and for goods retained in the manufacturing process for a considerable period, such as leather, cheese and tobacco.

7. *Supplies*

The essential characteristic of the class of capital goods called *supplies* is that they lose their original form in the manufacturing process. This point has already been well discussed. The importance of supplies varies greatly in different types of production processes. Fuel and feed are the two principal types. We have seen that the distinction between supplies and goods-in-process is often difficult to make. Wrapping paper is a product of one process and a supply material in the next. In general, that material whose form is most nearly preserved in the product is called the goods-in-process, for example, the hide that reappears in the leather; and those whose original forms are not recognizable in the product, the tannin and the oil, are called supplies. In practical problems of analysis, light, heat and a large number of small items are classified as supplies; also small articles of equipment, such as glassware, thermometers, pails, and the like.

So far as efficiencies and capacities are concerned, supplies offer no special problems. The efficiency and capacity of major supply items such as fuel and feed, are matters of prime importance.

All supplies are very easily moved; but some are highly specialized, having been manufactured for particular uses—for example, butter color, binder twine, and many chemicals used in manufacture. This is not true of most fuel and feed.

8. *Workstock*

Workstock partakes more nearly of the nature of equipment than of any classification thus far discussed. A horse is much like a power machine in many respects. The input is the feed, the output is the power exerted or load carried. The efficiency of a horse for feed is the output of work done per unit of feed consumed. Horses also vary in their efficiency in the use of man-labor; and in their efficiency for different kinds of work.

The important difference between workstock and machines is in their manner of depreciating. As already explained, it is commonly said of all live stock that it appreciates till full-grown and then depre-

ciates. Such a statement involves a certain amount of confusion of thinking. It is true that the horse will do more work at its prime than earlier, and would hire or rent for more per day. The output of useful work per unit of input of feed and of man-labor is more after a horse is full-grown and fully trained than at an earlier period. But the time when it will sell for most money comes several years earlier than the time when it will rent for most. This is because some of the useful years of the horse's life are spent before its prime; and every year that goes by means another year less of useful service. A work animal is born into the world with a certain amount of useful work latent in it. This first becomes available in the case of a horse at about three years of age. From this moment, the horse tends to decrease in latent productivity, that is, its total life-time capacity for pulling or carrying loads is being used up, and it is being used up largely whether the horse is worked or not. Horse-labor, like human labor, is largely perishable. The only part of it which is not perishable is that which will be used up later by harder work because of a period of rest. But although the horse tends to decrease in latent productivity from this time, the feed and care that are incorporated in its growth, the training which it receives, and the experience it acquires from its work, may more than offset this, so that even the latent productivity may increase for a period. In its early stages of use, a horse is partly in the condition of a machine which is still being built. Part of the feed and man-labor that are associated with it are converted not into a product of useful work, but into appreciation of the horse. The effect of the foregoing is to produce both depreciation and appreciation at the same time. What we are really interested in is the balance between these two—the *net* appreciation or depreciation. During its early years, this combination gives a net appreciation; and later a net depreciation. A horse therefore probably passes through four stages; first, a stage of all appreciation and no productivity—the colt stage; second, a stage of only net appreciation and of increasing current productivity; third, a stage of net depreciation and increasing current productivity; and fourth, a stage of all depreciation and also decreasing current productivity. The third stage is the "prime-of-life" stage.

Also most of the depreciation of workstock is fixed depreciation; that is, a horse grows old somewhere nearly as fast under light use as heavy use. The amount and kind of use does make a big difference, but that difference is less than the fixed depreciation. To illustrate:

Let us suppose that a horse that is worked only enough to give it needed exercise will live till about 20 years of age, giving about 16 years of work after depreciation sets in. If it were worth $160 at this point, the depreciation would average $10 per year. This would be fixed depreciation. Let us suppose that it would live till 14 years of age if worked hard. This would mean 10 years of useful work after depreciation set in, costing $16 per year. Of this $16, however, $10 would be fixed depreciation.

Depreciation, however, is a much smaller item than maintenance. A machine standing idle entails little or no maintenance input. A horse must be fed and cared for even though idle. The maintenance feed ration of an idle horse weighing 1000 lbs., computed according to the Wolff-Lehman standards, [1] is 8.02 pounds of digestible nutrients per day; of the same horse doing light work, 11.5 pounds per day; doing medium work, 14.2 pounds per day; and doing heavy work, 19.7 pounds per day. Labor and shelter are nearly constant regardless of amount of work done. Interest, taxes and insurance are also fixed items.

As with machines, using a horse intensively up to a certain point reduces the input of feed, shelter, interest, insurance and taxes per unit of output—for the reason that the fixed inputs become a smaller proportion of the total inputs. The only difference is that the large maintenance ration of workstock, and also the large fixed depreciation, make the effect much more pronounced. Wearing a horse out in a short period is therefore much more likely to be good business than wearing a machine out in short time.

There is, however, an additional factor involved with all animals, namely, the phenomenon of fatigue and restitution. An animal alternately uses up tissue, and then restores what has been used up. The heavier the work, the longer the period required for restitution. If not enough time is allowed for this, the animal wears out very rapidly. This places a definite check upon a too intensive use of workstock.

It will be apparent that the combination of a maintenance and a working ration makes the principle of diminishing outputs work out in a special way with workstock. If the animal is fed less than a maintenance ration, it will still turn out some work, but at the expense of the animal itself—the animal will depreciate. The same will be true if a maintenance ration is fed, but not a full working ration. At the

[1] Henry and Morrison, *Feeds and Feeding*, p. 671 (1915 edition).

other extreme, if more than a maintenance and working ration is fed, the animal will take on weight, which up to a certain point will represent appreciation. The principle of diminishing outputs can be expressed in terms of work outputs alone, or work plus gains or losses in weight or value. The full statement of it requires the latter. The same thing is also true, of course, when the principle is translated into its economic form and least-cost is determined.

Securing proper capacity combinations is somewhat difficult with workstock. The unit for most work animals is so large that it is frequently not easy to obtain a good fit. Three horses are too many—two are not enough. If, however, the operation is one which is repeated, so that the same horses and machines are in regular use, horses can usually be obtained of such size that two large ones or three small ones will serve fairly well. The difficulty comes in an organization such as a farm where the same horses have to be used for many operations.

In the matter of supply of workstock, a new circumstance is involved, namely, that capacity and efficiency in live stock cannot be reproduced at will as they can in machines. Breeding methods, in spite of recent developments, are still uncertain of results. They turn out ordinary capacities and efficiencies in abundance, but not high capacities and efficiencies.

With all classes of live stock, the problem of dual and even triple purposes enters. Some animals primarily used for workstock are at the same time productive live stock, breeding stock, and meat animals. Before we can understand the effect of this, however, we must analyze each of the three uses of live stock separately. With horses, there is the further complication that different breeds of horses are bred for different kinds of work, some for heavy draft work, some for speed only, some for a combination of the two.

9. *Productive Live Stock*

Productive live stock is the commonly accepted name for the forms of live stock that have some commodity for output. The principal live stock products are the several dairy products, eggs, and wool. The principal difference between workstock and productive live stock is the form which the output takes. They appreciate and depreciate in exactly the same way. A cow appreciates at first, then depreciates although increasing in productivity, then depreciates with decreasing productivity. Net depreciation commences at the point

where the loss of latent productivity more than offsets the appreciation from growth. A cow that never returns a net product never has any value so far as milk production is concerned; but it has some value for meat use. Net appreciation and net depreciation must take account of both uses. Productivity not made use of at the time is largely lost—only a small part of it can be recovered in later increased productivity. Maintenance and fixed depreciation are as significant with productive live stock as with workstock.

In the case of productive live stock, specialization in production has gone further than with workstock. The dairy type of cow is highly specialized. The effect of this is to produce wide ranges in capacity and efficiency. The poorest dairy cows produce less than a hundred pounds of butterfat per year; the best produce over a thousand pounds. These differences in productivity are partly due to capacity and partly to efficiency. The most efficient cows do not necessarily have the largest capacity. For a product of over a thousand pounds, both high capacity and high efficiency are necessary; but a four-hundred pound product may be much more largely due to capacity than to efficiency, or vice versa. Furthermore, these great differences in productivity, as with workstock, cannot be reproduced at will.

The combined use of live stock as productive live stock and for meat is very common; and to some extent almost unavoidable. Some of the important breeds of cattle, sheep and poultry are bred with both uses in view. The Shorthorn is a dual purpose breed of cattle; the Plymouth Rock, of poultry; and the Shropshire, of sheep. The most specialized breed of dairy cattle is the Jersey; of poultry, the Leghorn; of sheep, the Merino.

The principle of diminishing outputs works out the same as for workstock. If a cow is fed less than a maintenance and production ration, she will still produce milk; but at the expense of her body. At the other extreme, the opposite will take place.

10. *Breeding Stock*

In the production of beef cattle and swine, a breeding herd for purely breeding purposes is usually maintained, but in other cases the use of live stock for breeding is an unavoidable combination with other uses. This is unmistakably the case with dairy cows. There are no new circumstances connected with this use of live stock, except that the power of a highly productive animal to repro-

duce this productivity to a considerable extent, makes differences in capacity and efficiency in breeding animals much more significant than they would be for production alone. The value of a cow that produces a thousand pounds of butterfat per year is much more largely due to her potential value for breeding than for milk production; and her depreciation will be reckoned accordingly.

11. *Meat Animals—Growing Stock*

An animal appreciates while growing and while on feed exactly like a good-in-process. The principal difference between growing live stock and goods-in-process is the maintenance input. A chair in process of manufacture has no maintenance requirement. It has an interest, tax and insurance input; but so have growing animals. The maintenance input of a growing animal is in addition to these. The ration of an animal on feed can be divided into two parts, one, that required to maintain the animal in its existing condition; and the other, that which will be converted into gains in weight. This maintenance input is a large part of the total input. It includes labor and shelter as well as feed. If an animal is fed less than a maintenance ration, it will lose in weight. This is a stage in the working out of the principle of diminishing outputs that is equivalent to decreasing total outputs. As soon as the maintenance ration is passed, gain in weight will commence, this gain being proportional to the excess of the ration over maintenance. Every increase over the maintenance ration will mean that a smaller proportion of the feed is used in simply maintaining the animal, and that more is converted into gains in weight. This means lower input per unit of output. This will continue to a point where the animal will not take the extra feed.

Part of the gain in weight of a young animal is growth; part represents increase in fat. The former is acquired more readily than the latter. Hence the cheaper gains are made while the animal is young.

If a meat animal is fed a growing ration till maturity, and then a maintenance ration, it will simply appreciate till maturity and then depreciate. It will depreciate because its latent productivity is passing away, and because the quality of its meat is deteriorating.

Productive live stock and breeding stock may also serve as meat animals in part. As such, they are subject to the same stages. In general, because of their latent productivity in their other uses, they are kept beyond the point where their depreciation as meat animals begins.

12. *Growing Crops*

Growing crops are also a form of goods-in-process. At the start of the process is the seed—a very small beginning. Most of the utilities in the final product are added to the crop as it develops. This is also true in the case of growing live stock, but hardly to the same degree. With growing live stock, it is the feed principally that adds utility; with crops it is more largely the man-labor and horse-labor of cultivation and harvesting than anything else; but a good deal of it is materials supplied from the soil and air. Growing crops are very perishable—in the sense that if the man-labor and horse-labor are withheld at any stage, the crop is lost, and all previous labor goes for naught. This is true, however, of a good many other goods-in-process—of bread, for example. Growing crops are in addition especially subject to the weather. They frequently depreciate rapidly during adverse weather conditions. A spell of hot sultry weather while spring wheat is ripening, may almost ruin the crop.

An aspect which is common to all goods-in-process, but especially significant with growing crops, is the possibility of varying the intensity of care of the crop at different stages of its development. The crop may be planted very carefully and yet cultivated and harvested in a slipshod hurried manner with as little input of man-labor and horse-labor at these stages as possible. Or the planting and cultivating may be done superficially and the harvesting carefully done. Thus it is hardly safe to undertake to analyze the whole production process as a unit. The practice in such a case is to break it into sub-processes or "operations," such as plowing, preparation of seed-bed, planting, cultivating, harvesting and threshing. Factory production is similarly broken up into processes.

13. *Organization*

The nature of organization has already been pretty fully discussed. We are interested in it here as an element in production. It will be remembered that organization as a product may arise from changes to commodities or changes to persons. The organization that arises from changes to persons will be discussed in Chapter XVI under the head of The Human Agent in Production. That which consists of changes to commodities inheres mostly in such things as choice of location, adjustment of size of plant to probable volume of business, proper proportioning of elements to each other

and combinations of capacities and efficiencies, arrangement of plant, and records of operations and transactions. These are built up as a result of effort directed to these ends. This means that they appreciate like a machine that is being built. But they may also depreciate like a machine that is in use. This is the principal characteristic of production elements of this type. They have no regular stage for appreciation and no period of life. They increase when effort is directed to increasing them, and decrease when the effort slackens. It costs effort to develop them, and effort to maintain them. But not so much by far as to develop them. One of the reasons that effort is required to maintain them is that constant change in the economic world without necessitates changes within the organization—in size, proportion of elements and the like. The highest-profit combination may be different from year to year. Economic changes may seriously affect their value. They are thus peculiarly dependent upon the economic environment.

Concrete analysis in terms of organization capital will always be difficult. The input of organization in a production process is almost impossible to determine. Not being measurable, it can have no definite cost-rates. The output per unit of input of organization is therefore impossible to determine. Least-cost and highest-profit combinations as actually figured do not therefore include organization. The effect of including them would usually be to move the least-cost combination to the right a little, since the organization input is largely a fixed input. Once it has been built up, it is, like the plant itself, practically constant regardless of volume of business. It may, however, be a different proportion of total input with a large enterprise than with a small one.

14. *Money*

Money, considered first simply as coins, bank notes and the like, is in the same general class of capital goods as equipment. It starts out on its career of usefulness as a finished product and actually depreciates, in the physical sense, from the start. The losses due to abrasion of gold and silver coins amount to considerable in a year. It costs the federal government several million dollars a year to maintain a supply of more or less intact paper bills in circulation. By governmental processes, however, the values of different moneys as media of exchange are in general maintained at the same level regardless of physical depreciation. A principal characteristic of money is its

extreme appreciation and depreciation in value. It depends for its value upon the economic environment in which it is functioning. Every change in the price level means a change in the value of money. These changes, however, affect money in the aggregate, not the relative values of particular coins or notes. The other outstanding characteristic of money as a capital good is its extreme mobility. By definition, it must be something which passes freely from hand to hand.

Our monetary systems must not be thought of in terms of coins and banknotes only. Bank deposits, store credit and the like play a larger rôle than mere currency. The way in which these behave in the process of production will be discussed in a later chapter.

II. CAPITAL GOODS AS A FORM OF WEALTH

The wealth of a country at any given time consists principally of its lands, its capital goods, and its durable consumption goods. The latest official estimate of the national wealth of the United States is given in Table XX, and is for the year 1912. This list is very far from complete, but it includes most of what is reduced to a value basis and usually included in such computations. The total wealth of the country in 1920 on this basis was probably somewhere around three hundred billions of dollars, part of the increase being due to an actual increase in quantities of goods, but more of it to the rise in the price level.

Of the items listed in Table XX, everything is capital goods except the following: the land part of real property and of railroad rights-of-way; and private residences, clothing and personal ornaments, furniture and carriages, public parks and certain public buildings and the like, which are mostly direct consumption goods. Furthermore, these figures do not include, or at least do not intend to include, organization capital. And "carriages" include many automobiles which are used in production and hence are capital goods. If some little allowance is made for these items, it will appear that probably three-fourths of the national wealth in 1912 was in capital goods of one form or another, and about a fourth was in land and in consumption goods. If all consumption were direct and immediate and there was no roundabout production, the only wealth existing would be land. The addition of durable consumption goods in the form of houses, furniture, etc., gives us wealth in a second form. Finally, the addition of capital goods gives us wealth in the third and most important form. The more roundabout the production,

the greater the national wealth, because the more wealth will be incorporated in machines, equipment, buildings, live stock, goods-in-process, etc.

TABLE XX. ESTIMATED NATIONAL WEALTH OF THE UNITED STATES, 1912 [1]

Form of wealth	*Estimate (in millions)*
	Dollars
Real property taxed	98,363
Real property exempt	12,314
Live stock [2]	6,238
Farm implements and machinery	1,368
Gold and silver coin and bullion	2,617
Manufacturing machinery, tools, etc	6,091
Railroads and their equipments	16,148
Total	143,139
Street railways, etc.:	
Street railways	4,597
Telegraph systems	223
Telephone systems	1,081
Pullman and private cars	123
Shipping and canals	1,491
Irrigation enterprises	361
Privately owned waterworks	290
Privately owned central electric light and power stations	2,099
Total	10,265
All other:	
Agricultural products	5,240
Manufacturing products	14,694
Imported merchandise	827
Mining products	816
Clothing and personal ornaments	4,295
Furniture, carriages, etc	8,453
Total	34,325
Grand total	187,729

A country is therefore wealthy for three reasons, first, because of its supply of land and other natural resources; second, because of the supply of durable consumption goods it accumulates; and third, because of the supply of capital goods it accumulates. Of these three, the third is, in a country like ours, easily the most important. The

[1] *Statistical Abstract*, 1922, p. 625.

[2] Including live stock on farms and ranges and in cities and towns.

richer countries of the world are constantly increasing their supply of capital goods. And the poorer countries borrow from the richer to increase their own supplies of capital goods.

III. RELATIVE IMPORTANCE OF DIFFERENT FORMS OF CAPITAL GOODS

It will be possible, from Table XX and other available sources, to isolate only certain forms of capital goods, and this only in the form of very rough estimates. In 1912, factory equipment was worth about $6,091,000,000; factory buildings about $20,000,000,000, and manufacturing goods-in-process, including those in transit and on merchants' shelves, $14,694,000,000. The capital goods of railroads are divided mostly between buildings, land reconstructions, land fixtures, and equipment. Street railway, telephone and telegraph systems are mostly land fixtures and equipment, the former being the more important of the two. The capital goods of the mineral industry are divided mostly between land reconstructions, equipment and buildings and goods-in-process, the first being by far the largest total. The total value of all four in 1912 was probably about $4,000,000,000. Table XX includes $816,000,000 of value of mining products in the form of goods-in-process. The capital goods used in merchandising are divided mostly between buildings, goods-in-process, and equipment, the first two being the most important. Perhaps a fifth or more of the taxed real estate listed in Table XX consists of stores, banks, offices and exchange buildings and the like. The $14,694,000,000 of manufacturing products already mentioned are probably more than half on the shelves of retail and wholesale merchants, and also a considerable part of the agricultural products mentioned in Table XX.

A somewhat better separation can be made for agriculture. The 1920 census divides all farm property as follows:

	(millions)
Land	$54,830
Buildings	11,486
Implements and machinery	3,595
Live stock	8,013
	$77,924

To this should be added some part of the agricultural products listed in Table XX.

The census further classifies live stock as follows: [1]

[1] Volume V, pp. 33 ff.

	(millions)
Horses and mules	$2,570
Cattle	3,652
Sheep, goats	413
Swine	989
Poultry	373
Bees	17

Of the cattle, $1,885,000,000 is given as the value of dairy cattle, meaning cattle in herds kept primarily for milk, and $1,507,000,000 as value of dairy cattle of milking age. Live stock can be reclassified roughly as follows:

	(millions)
Productive live stock mostly	$1,600
Productive and meat combined	700
Meat mostly	2,500
Workstock mostly	2,500
Breeding stock only	230
Breeding and other combined [1]	3,200

[1] Duplicates other classifications.

In conclusion, of the total supply of capital goods in the United States, it can be stated roughly that something over 40 per cent is in buildings, over 20 per cent is in land reconstructions and land fixtures, over 15 per cent in goods-in-process and supplies, over 10 per cent in equipment, over 5 per cent in live stock of various classes, and less than 2 per cent in currency. How much is organization capital cannot even be estimated.

SUGGESTIONS FOR FURTHER READING

Chapter V of F. M. Taylor's *Principles of Economics* (1921), discusses in some detail the functioning of capital goods in production. The reader is also referred to Chapter 5, Vol. I of F. W. Taussig's *Principles of Economics* (1921).

For further treatment of depreciation, see Chapter XXII, pp. 482–485, and Chapter XXIII of *Principles of Accounting* (1922), by William A. Paton and Russell A. Stevenson, and Chapter VIII of *Accounts, Their Construction and Interpretation* (1915), by William Morse Cole.

PROBLEMS

1. Rule a sheet of standard-size (8½ by 11 inch) paper into table form and fill in a brief statement for each class of capital goods.

Kind of Capital	*Principal Manner of Depreciating*	*Extent of Obsolescence*	*Its Fixed Inputs*	*Its Variable Inputs*	*Degree of Mobility*	*Degree of Specialization*	*Miscellaneous Remarks*

2. In what respects are all capital goods alike?
3. Do you consider your education an investment? If so, are you capital?
4. Which, when, why, and from what point of view are the following capital?
   a. A trained army?
   b. A trade-mark?
   c. A suit of clothes?
   d. Railroad bonds?
   e. The University?
   f. An out-of-date text book?
5. a. Distinguish between value and physical depreciation.
   b. Give an example in which value depreciation depends on physical depreciation.
   c. Give an example of value depreciation without any physical depreciation.
   d. Give an example of physical depreciation without any value depreciation.
6. If you were to compare the costs of producing a product in several plants or factories, why would you have to use a straight-line method of figuring depreciation, and an interest charge on one-half the investment?
7. If a department store uses five Ford delivery trucks, each one lasting five years, but so distributed that they buy a new one each year, is there any depreciation?
8. By the use of any suitable illustration, explain the difference between fixed and variable depreciation.
9. a. How much would a person have invested in a machine and how much in some kind of a reserve at the end of the 8th year if the machine cost $700 and lasts 10 years?
   b. At the beginning of the 8th year?
   c. What would be the interest charge in the 9th year, assuming a rate of 6 per cent per annum?
10. Explain clearly the difference between fixed and variable machine inputs.
11. Is the raw material worked on by a machine a machine input? Why?
12. Why are most machines in factories run beyond the point of least cost of operating the machine as a unit?
13. Why are machines made in so many sizes and grades? Why not in still more sizes and grades?
14. Under what conditions would it be economical to buy a machine that was too large? or too small? or inefficient?
15. At what period of life is workstock most valuable? Why?
16. What is the difference between the common use of the word "productive" in economics and its use as commonly applied to live stock? Do the two uses have anything in common?
17. a. How does the necessity of a maintenance ration affect calculations of least cost in producing with live stock?
    b. Is this comparable with the power requirements necessary to run a churn empty? Explain.

18. Over a long period of time and for most capital goods, value depreciation depends on physical depreciation. Is this true in the case of money? If the government keeps all moneys at equal value, is there any loss from physical depreciation?
19. Are wealth and capital goods synonymous terms? If not, what is the difference?
20. In comparing the wealth of a country at two different periods, why is it necessary to correct for changes in the price level?

CHAPTER XV

THE EARTH IN PRODUCTION

There are many things about the earth as a whole and its behavior and place in the solar system that have a profound influence upon its contribution to production. Its distance from the sun and rotation period make possible plant and animal life in its present form. Its orbit, and rate of travel in its orbit, coupled with the inclination of its axis from a perpendicular to the plane of its orbit, produce the seasons and variation in the division of the day between light and darkness. Its system of wind circulation profoundly affects the climate and rainfall of all regions. But it is not the purpose of this chapter to discuss these general physical relationships of the earth, but rather to discuss the utilization in production of the materials and forces that make up the earth.

As a matter of fact, only a small part of the earth sphere plays any active part in the processes of production. Actual production is mostly confined to a few feet from the earth's surface. The deepest mines reach down only a little over a mile. For purpose of discussion, that part of the earth which participates in production may be included under three heads, the atmosphere, the land sphere, and the water sphere, the latter two including any sub-surface portions of the earth which may be utilized. Of these three, the land sphere is by far the most important in the economic sense and will receive most of the attention in this chapter.

I. THE LAND SPHERE

The following is a classification of the uses to which the land sphere is put:

A. Surface appropriation.

- a. Crops
  - Artificial—field crops, forests, woodlots, gardens
  - Natural—forests
- b. Pasture
  - Artificial
  - Natural

c. Building sites
- Manufacturing
- Mercantile
  - Wholesale
  - Retail
  - Banks
  - Etc.
- Farm buildings
- Transportation—depots, etc.
- Storage—warehouses
- Residences
- Public buildings
- Etc.

d. Highways and streets
- General use—roads
- Limited use—railroad rights-of-way

e. Parks and other recreation uses.
f. Open-pit and placer mines; quarries
g. Wharves, docks, beaches, etc.

B. Sub-surface appropriation
  a. Shaft mines
  b. Wells—water, oil, gas, etc.

In this classification, the land or solid surface of the earth is separated from the water surface. It should be evident that from a production standpoint the land surface and water surface are sufficiently different to warrant separate treatment. The line between land and water is somewhat difficult at times to draw. A swamp is sometimes as much one as the other. On shorelines, the land surface may be pushed out into the water by driving piles for foundations.

To limit the concept of land merely to the surface of the earth and the materials which comprise this surface, would rob it of most of its significant characteristics. The properties of a piece of land are due not only to its soil and mineral content, but to the amount of sunlight it receives, its rainfall, its frost and growing season, its location with respect to markets, etc. Land therefore includes not only the solid surface of the earth, *but the natural properties that are associated with it, the air and sunlight, the rainfall, the winds, etc.*, in so far as these affect the use of the land as land. A piece of land, moreover, may have properties which it did not derive from nature, but were man-made, which behave like nature-given properties and are so identified with it that they cannot be separated. The plant foods which are added to soil artificially in most cases behave in the same way in production as the same elements would if naturally in the soil. Once incorporated in the soil, they are used up in production in the same way as the nature-given plant foods. Similarly, a tract of naturally level land

is little different from one which has been artificially leveled, at least after the leveling has been done a few years. All of the work of clearing land and reducing it to cultivation falls under this description. Accordingly it is proper to include in the definition of land also any artificial properties which behave like the natural properties once they have been combined with them. Such a definition of land will not appear fanciful to men of the world. When they speak of land in ordinary conversation, they mean exactly what is included in the above definition.

In both legal and common practice, the term *real estate* is also used. This includes both land and all things attached to the land—to use the legal term, the *immobilia*. In this treatise, real estate is divided into four classes: land, land reconstructions, land fixtures and buildings. When we buy a piece of land in the legal sense, we undoubtedly buy the land reconstructions and land fixtures that go with it, the ditches, the fences, the roads and bridges and the like. We buy the buildings and growing crops upon it also. In this treatise, land reconstructions are separated from land proper because, as already explained, they depreciate much like buildings, starting out on their useful careers as completed capital goods, and depreciating from first use till they are worn out, unless in part or in whole renewed occasionally. This is even more true of land fixtures. As for some forms of land reconstructions—ditches, for example—it must be admitted that their behavior in production is as much like that of land as that of buildings.

Land may also be classified on two other bases as to use. One of these involves the distinction between mining and farming. In mining, the materials of the earth are taken away and will never be replaced within ordinary reaches of time—they will be replaced only in the geological sense, and in many cases not even in that sense. The land or earth surface still remains, but its valuable materials are mostly gone and are unreplaceable. In agriculture, on the other hand, although the growing crops take plant foods out of the soil, these plant foods can be replaced and are replaced in a very practical way, so that the valuable properties of the soil can be maintained at the desired level; or even if removed, can in nearly all cases be restored at some subsequent date; and that restoration will not involve a complete rebuilding, such as the restoring of a building would.

Land can also be classified as to whether or not it has been appropriated, and its degree of appropriation. Much swamp land has not

been appropriated at all—is not now being put to any use. The same is true of very rough land, land too far north, or inaccessible for other reasons.

The Properties of Land as a Production Element.—We are interested in this course only in the properties of land which affect its behavior in the processes of production. The production processes are somewhat different in the several uses to which land is put, in crop uses, pasture uses, highway uses, site uses, etc. They all, however, have certain things in common, and these will be presented first:

1. *Land never entirely depreciates in the physical sense*—except under such unusual or occasional circumstances as the sinking of the surface during earthquakes, the wearing away of shore lands by the waves, etc. This is just another way of saying that land has certain irremovable properties. First among these are *standing room* and situation. No matter what is done to land within ordinary experience, there will always be a certain area of the earth's surface, and the size of that area will not be changed. Land, in other words, represents a certain amount of room or expanse of area over which to walk, or upon which to stand, or erect buildings, or grow crops; and this in no practical sense can be taken away from it. The standing room may be rendered valueless; but it will still be there.

The same is true of the *situation* of a piece of land. A tract of land which is five miles from a certain river will always be the same five miles—unless the river changes its course, in which case it is the river and not the land which has changed its situation. This is only another way of saying that land is absolutely *immobile.*

It is also pointed out that the elevation of a piece of land, or *situation* in the vertical dimension, is relatively fixed; but this is only another way of saying that land topography is relatively unchanging, which is a better way of referring to it. Geologically speaking the earth's surface is constantly being worn away and leveled down by weathering and erosion, which effects are being offset in turn by elevations of the crust. But these processes are outside the ordinary reaches of human experience.

These three properties, standing room, and situation and topography, are the only three which are accepted as irremovable by most economists. The author is inclined to believe that in all ordinary uses, certain other properties of land are at least not likely to be removed. For example, it would require an expenditure of effort that is never likely to be forthcoming to make the sandy lands of the Atlan-

tic Coastal Plain into the alluvial soils of the Yazoo Delta. Or to make the arid lands of Nevada into the well-watered prairies of Iowa. And it is utterly impossible to make the frosty reaches of northern Canada into the jungles of the Amazon valley. It may be argued that some of these are matters of situation, of situation with respect to latitude, and bodies of land and water, and mountains, etc. But this again is stretching the notion of situation a good ways. Surely rainfall and frostiness are properties of land as truly as topography and fertility.

As for the soil properties, surely under anything but hypothetical uses, the soils of different regions will always remain different, and none of them will depreciate to the point of losing their characteristic properties of texture, composition, water-holding capacity and the like. No matter how wastefully the soil is used, it will in nearly all cases be capable of being restored to its former condition. Exceptions to this are deforested lands, which have eroded so rapidly from rainfall and wind that it is practically impossible to reforest them; or the expense of doing so is prohibitive at present, so that the wind and water keep on doing their destructive work.

When depreciation is considered in its final form as a *value concept*, the foregoing statements need to be somewhat qualified. Land may depreciate in usefulness to the point where no individual will pay anything for it. The room and situation will remain and much of the soil, but they may have no value from the individual standpoint. But nations look further into the future than individuals. There is very little of the earth's surface that some nation will not buy for a consideration. Even though a piece of agricultural land has depreciated from wasteful use till it will grow no crop whatever, the room and situation and rainfall and climate and certain soil properties do remain, and these may prove to be useful at some distant time.

2. Although land is perfectly immobile, *it is in general far less specialized than most elements of production.* It can be shifted rather easily from residence to mercantile or manufacturing use; or from one crop to another. It is no fault of the land itself that such shifts do not take place readily, but of the buildings and other capital goods placed upon the land, or of the laborers working upon it. Elevation, topography, and climate and rainfall may place important limitations upon the uses to which land may be put; but usually *there are a good many alternatives left.* This freedom of use is of vast significance and may go a long ways toward offsetting the disadvantages of immobility.

3. *Land appreciates in use as well as depreciates; and the apprecia-*

tion and depreciation have no regular period of occurring, as with live stock, but instead either may occur at any time. Land is in this respect like organization capital. These circumstances are partly the result of the fact that land has no period of life, in the usual sense; which is a corollary of the statement that it never entirely depreciates. If a given piece of land were used for growing the same crop year after year, it would be worth less after each year's use, and would reach a point presently where it would have no value for growing the crop; and this might be interpreted as its period of life for this use. But the land would still have other uses to which it could be put; and presently it would be useful for growing the same crop again.

Land may *appreciate* in any of the following ways: from the addition of fertilizers; from cultivation, resulting in improvement in tilth; from eradication of weeds; from growing crops which add humus and nitrogen to the soil; from leveling; from the building of roads or street-car lines or railroads; from improvement of the streets; from improvement in the quality of homes built in the neighborhood; from growth of the city; from improvements in markets; from a rise in the price of its products. It may *depreciate* in any of the following ways: from the growing of crops upon it, which uses up its plant food; from poor cultivation; from becoming weed-infested or disease and pest-infested; from erosion; from a decrease in the population of the city; from a degeneration of the neighborhood, due to enroachment of factories, slums, foreign districts, or railroads; from a deterioration of markets; from a decline in the price of products. It is clear, therefore, that at any given time a piece of land may be either appreciating or depreciating; or it may be appreciating from one cause, and depreciating from another. What we have to deal with is really a *net* appreciation or depreciation.

Obviously appreciation and depreciation are quite different processes for land in its different uses. The depreciation of a factory site is entirely different from the depreciation of farm land. The full discussion of these processes must therefore be taken up under the separate uses of land later in the chapter.

4. From the foregoing it should appear that *obsolescence*, and its opposite by whatever name it should be called, *are very important in the case of land*. Obsolescence, it has been explained, arises whenever the future uses of a good become less valuable than present uses. The future uses of land have no limit. He who buys a piece of land buys its future uses until the day of judgment. Hence there is an abundant

opportunity for future uses to change in value. Of course it is the future uses of the next twenty-five or fifty years that are most significant; but even in twenty-five years many changes may take place affecting the value of the uses of land. For example, the boll weevil may invade the region and make cotton more difficult to grow; or a new competing region may begin producing wheat in abundance; or the automobile may supplant the carriage, causing the decline of the city's most important industry; or the Italian quarter may invade a fashionable residence section; or the city may begin growing in another direction. Any of these developments may cause the land actually to depreciate in value.

But on the whole, *there are more changes taking place in land which cause its* future uses to be more valuable—at least, until a country reaches a static condition like China—than the contrary. Chief of these is the growth in the world's population, making the products of land more valuable as time goes on. Another is improvements in production, making it possible for an acre of land to yield a larger product. Another is the accumulation of capital goods, giving land more of the other elements to work with.

And yet there are whole cities in which urban land is depreciating in value due to the shifting of industries; and whole sections of the country in which farm land is depreciating in value due to the competition of newer or more productive areas, as did the land in the New England and North Atlantic States from 1880 to 1900.

5. *Land has in general no fixed depreciation.* It does not depreciate standing idle. Over long periods of time, most land will actually appreciate if left alone. If it is a prairie country, it will accumulate more humus. If it is a timbered country, it will grow heavier forests. Over short periods, some land will appreciate and some will depreciate. If in grass, it will benefit from lying idle. If in brush, like most of our cut-over land, it may become more difficult to clear from year to year. Our so-called abandoned lands of the East are probably appreciating, because they are going back to timber and pasture, which are no doubt their most advantageous uses.

6. *The principle of diminishing outputs works out in a special way in the case of land.* This is true of the principle both in its physical and its economic application. In our discussion thus far of combinations of land and the other elements, we have reduced land-use to an annual basis, and have expressed cost-rates as annual rents per acre. Much land is rented for cash in most regions, so that it is possible to obtain

actual market rates for the use of land. The cash rents paid do not include all the items of land input—for instance, they do not usually include taxes and upkeep—but those that are not included can usually be added with a fair degree of accuracy.

There are, however, some of the same objections to this procedure as in the case of capital goods. The various land inputs do not vary at the same rate with inputs of the other elements and with outputs. Interest and taxes are fixed inputs, and depreciation, upkeep, and supplies are variable inputs. At any given time the interest input is the same regardless of output; and the same with taxes.[1] Upkeep is a small item, representing the labor involved in killing weeds, checking erosion and the like; obviously it will vary with the use of the land.

There are two possible ways of considering some of the inputs involved in the use of land for growing crops. Lime applied to soil to correct its acidity may be looked upon as supply used to maintain the condition of the land; or it may be looked upon as an input for the particular crop in connection with which it is applied. Since it lasts over several crops, one is disposed to call it a land input. But if lime is handled this way, how about ordinary fertilizers that contribute most to the first crop, but still somewhat to the second and third crops following? The good effects of cultivation and tilth are likewise not received wholly by the crop being grown, but are carried over to the succeeding crops. The cultivating that a corn crop receives leaves the land in better condition for the oat crop which follows. The cultivation is therefore only partly used up by the corn crop.

Probably the best way of handling this difficulty is suggested by prevailing practice. When a piece of land is rented, what is paid for is the plant food already in the soil which can be utilized in the growing of a crop. It may be natural plant food, or plant food that has been put there by previous applications of fertilizer. This much plant food is *land input*, and any of it that is used up is considered a depreciation of the land. Any new fertilizer which is applied is considered as *crop input*. The land inputs are paid for under prevailing practices in the rent; the crop inputs are not. The only difficulty with this procedure is that the fertilizer applied is not all used up by the crop grown. This makes it necessary to determine if possible what part of it is still unused, and subtract this from the fertilizer input. Experiments have been carried on in various places to determine what part of the

[1] Over a period, both interest and taxes may rise as land values rise following increasing outputs.

fertilizer is used up by each successive crop. A rough rule followed in some places for certain commercial fertilizers is as follows: 40, 30, 20, 10—that is, 40 per cent the first year, 30 per cent the second, etc. As for cultivation, the common practice is to charge all of it to the crop cultivated; but obviously some part of it should usually be subtracted and carried over to the succeeding crops. The clovers and other leguminous plants, while taking some plant foods out of the soil, actually add nitrogen to it by taking it out of the air, and nitrogen is an especially scarce plant food element. Hence it is doubtful if any soil depreciation ordinarily takes place with such crops. The small grain crops also frequently serve as "nurse crops" for clover and grasses, that is, they shelter them and protect them from competition with weeds while they are small. This does not represent an appreciation of the land, but merely a contribution to a succeeding crop. It should, therefore, really be counted as part of the output of the grain crop. There is some argument also for considering the nitrogen which clovers add to the soil as an output of the clover crop.

The addition of fertilizers to any crop saves a good part of the depreciation of the land. If the fertilizer which is added supplies a well-balanced ration of exactly the foods needed by this crop, then the land will not depreciate at all; in fact, will have appreciated at the end of the season by the amount of the fertilizer applied that this crop has not used. Rarely, however, is a fertilizer ration worked out on this basis. Instead, it is designed to supply only those food elements in which the soil is deficient. Consequently, what happens is that the supply of some plant foods is reduced by the crop, while the supply of others is more than maintained by the fertilizer applied. The result may be either a *net* depreciation or a *net* appreciation. When fertilizers are applied only at intervals, as is usually the case, the process after the first year is all depreciation.

The principal other crop inputs are ordinarily man-labor, horse-labor, machines, seeds, insecticides and other supplies. The man-labor, horse-labor, etc., applied may leave the land in better condition than before the crop was planted. If so, there has been an appreciation which more than offsets the depreciation above mentioned. This can be considered as part of the output, or deducted from the total land inputs.

Depreciation obviously varies with the output. The larger the yield, the more the plant food used up. Probably it is somewhere nearly proportional to output. One principal reason that it is not is

that not all parts of a plant are equally valuable, and different inputs produce different proportions of stalk and grain. Depreciation can also be considered as varying with the other inputs, with the amount of seed planted, the amount of labor used, etc. It is therefore a variable input.

Although little has been said of the fixed inputs, interest and taxes, they are in fact more important inputs than depreciation and upkeep. In other words, the interest on the value of the plant food

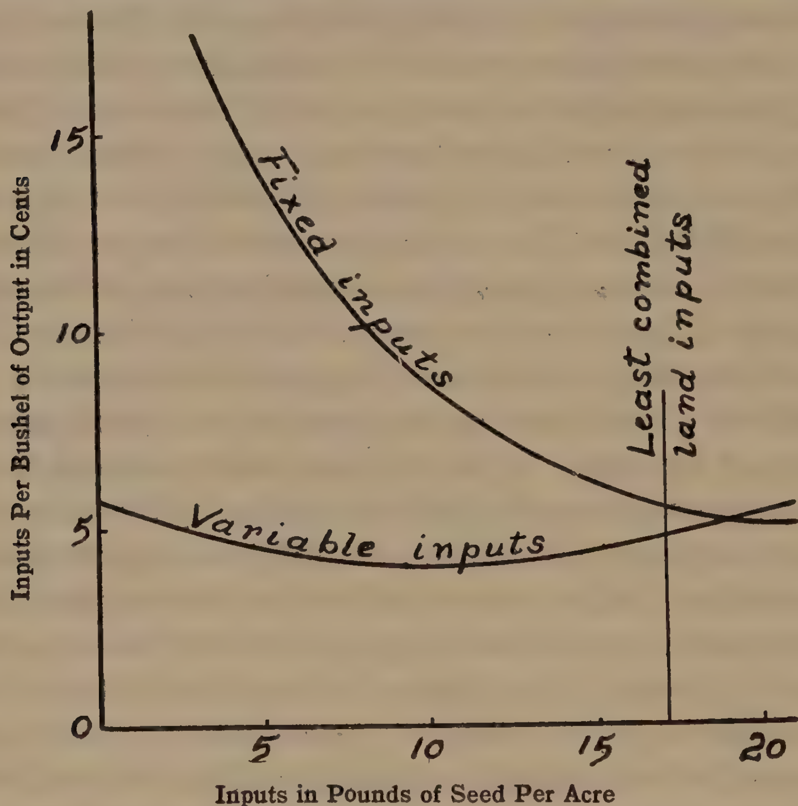


FIG. XL. Variations in Land Inputs.

in the soil is a larger item than the plant food taken out by any crop. This means that the ultimate supply of plant food available in the soil is great in comparison with what is used by any one crop. This is true largely because it is presumed that the plant food will not be wastefully used, but will be conserved by crop rotation, keeping live stock, and using fertilizer to supplement the plant foods in the soil and keep them properly balanced.

Since the fixed inputs are larger than the variable inputs, the point of least combined land inputs is pushed to the right somewhat beyond the point of least depreciation per unit of output. This is illustrated by Figure XL. Thus the higher the interest rates, the farther forward will the least-cost point be. If the other inputs, namely, man-labor,

horse-labor, machines, fertilizer, were added to land inputs, the least-cost combination might occur either earlier or later than in the diagram.

7. *Land does not occur in units* as do machines, buildings, live stock and the like. This means that a tract of any desired size can be measured off. In actual practice, however, our system of land survey causes most farms to occur in multiples of forty acres; and city lots are quite uniform in size.

8. *Area is especially significant in the case of land.* In order to obtain volume in production, a considerable area of land is needed. This introduces the problems of locomotion and transportation. Much of the work must be done with traveling equipment. Produce and supplies must be hauled. Sometimes the length of the haul is an important limiting factor. To secure an adequate food supply for a large city, crops must be grown at long distances from the market and then transported.

Area is definitely associated with the capacity and efficiency of land. Land with large capacity will produce the required volume from a relatively small area, especially if it is highly efficient at the same time. Land may be efficient in its use of other elements, especially labor, without having large capacity, although in general low capacity means reduced efficiency in the use of labor and equipment because it makes necessary extra traveling and hauling. Even in pasture uses, land may have such little capacity that the animals are kept poor looking for feed.

Another very important effect of area is that it makes those who work the land live apart from each other on individual farms or in small villages. They must so live in order to be near their work.

9. *Location is significant in a special way in the case of land.* The product is much greater from an acre of land used as a factory site than from an acre used for crops, which makes it more important that the factory be located in the right place than the farm. But the factory usually can be located in the right place, reasonably near both to its markets and to its source of raw materials, whereas the land suitable for growing a given crop cannot be moved. There may be several areas which might be so used; but often there is not, or some of the suitable areas are still better suited to other crops. This is especially important in the case of mines and forests.

10. *The supply of land is peculiar in several respects.* In the first place, there is a definitely limited supply of land in any one general

location. This is an effect of its dependence on area. It is especially noticeable in the downtown districts of large cities.

In the second place, land cannot be freely reproduced as can machines, live stock and the like. Additional land can be brought into use, but there is an easily-attained limit upon this. And moreover, the additional land is in most cases either not so desirable or not so accessible as the present supply.

Third, grades of land cannot be reproduced freely. There is a very limited supply of the best land. The grade of most land can be raised, but there are definite limitations upon this also. Since grades of capacity and efficiency of land cannot be freely reproduced, the existing differences are especially significant. He who takes possession of a better piece of land than his efficiency fits him for, is taking it away from somebody else. If it were a machine, another could be manufactured.

Fourth, there is usually a supply of unappropriated relatively unproductive land to draw upon. No one deliberately brings into existence a supply of machines too inefficient to be worth using. An increased demand for the product ordinarily requires more machines to be manufactured. Machines just ready to be scrapped may serve for a little; but presently there must be new ones manufactured. With land, an increased demand may cause "sub-marginal" land to be drawn into use.

11. Because of many of the foregoing considerations, *the use of land in production is more particularly influenced by social institutions, such as the home and family and the state, than most other elements of production.* Agricultural production is especially influenced by family considerations. In urban uses, the small supply of land available in downtown sections of large cities produces congestion and slum districts. Military preparedness and other national considerations have played a large rôle in the agricultural production policies of many nations.

Crop Uses.—In most of the foregoing discussion, crop use has been given most attention. So far as physical depreciation is concerned, the use of land in growing crops depreciates it more rapidly than any other use. But by the same sign, if continuous agriculture is to be carried on, this depreciation must be replaced; and it usually is, at least eventually. Consequently depreciation and appreciation constantly alternate in crop farming.

Land devoted to crop use is about as free to shift from one product

to another as almost any type of land. Crop rotation systems can be changed a great deal in one year. If a Republican administration puts a high tariff upon flax, the farmers can double the flax acreage next season.

The production period of most crops is a year. Input and output must therefore be measured on a year basis. The principal exception to this is timber, grown either in forests or in farm woodlots. Output in this case can be measured either in annual growth; or in timber cut over a production cycle.

Distinction needs to be made between the use of land for growing crops, and the appropriation of a natural supply of such a crop as timber. The process in this latter case is simply the harvesting of a ripened crop,—like the harvesting of a corn crop. Under natural conditions, a timber crop dies down and eventually the plant food which it drew from the soil returns to the soil, except in so far as wind and water carry it to other parts. A natural forest is therefore a self-feeding crop. Carrying off the timber, therefore, actually does carry off plant food. The roots of most trees, however, reach far enough into the ground to draw upon the almost inexhaustible supply of mineral plant foods in the subsoil; hence forests are mostly able to obtain all the plant food they need even though harvested systematically. But cutting the timber from a stretch of sandy land, or from a steep hillside, may start erosion at such a rapid rate that the forests never get a chance to renew themselves. And forest fires help with the destructive work.

Pasture Uses.—The land inputs where land is used for pasture are all fixed inputs except seed and the labor of planting the first year. Most land actually appreciates under pasture use; and there is no upkeep cost. The other inputs are small also, except the live stock itself. The capacity of land in pasture use is measured by the number of head it will support at best advantage; and the efficiency in terms of the gain in weight per head. The efficiency depends mostly upon the quality of the grass or clover growing on the land. Except in very thin pastures, requiring much travel to secure food, capacity and efficiency vary almost independently of each other. Where pasture farming is highly specialized, the unit is frequently rather large. One man can handle a large acreage of land in pasture use. It also lends itself to large-scale operation, one man supervising many others.

Natural pastures have none but fixed land inputs. There is no depreciation unless the pastures are overstocked, as has been the case

upon some of our Western ranges recently. Under natural conditions, our prairies actually appreciated, accumulating a deeper and deeper layer of humus, differing in this respect somewhat from forests.

Building Sites.—Appreciation and depreciation of building sites are mostly value phenomena, and arise from economic conditions external to the land under consideration—from such things as the growth of the city, shifting of the manufacturing district, encroachment of the retail district, etc. Obsolescence and its opposite are therefore the usual forms which depreciation and appreciation take in the case of building sites. Use of a piece of land as a site for a residence or factory does not in itself affect its future usefulness or value except in a few special cases where public nuisances are created thereby.

The other elements used with building sites are buildings, raw materials, equipment, power, supplies and labor in the case of factory use; buildings, goods, equipment, supplies and labor in the case of mercantile use; and merely buildings in the case of residence use. In any of these uses, building input is likely to be an important fixed input. The higher the cost-rate on the fixed input, the more of the other inputs required for a least-cost combination. This accounts for the many-story structures in the downtown sections where site values are high; and for apartment house sections in some locations and not in others.

The supply of land for building sites would at first thought seem to be inexhaustible. Actually, however, people tend to concentrate in cities, so that desirable sites for almost any purpose are decidedly limited. The expansion of a city therefore raises a constantly more difficult transportation problem both for the population itself and for commodities.

As already suggested, the social aspects of site use are of great significance. Cities may be planned in such a way as greatly to increase the convenience and social advantages of living in them or in various parts of them. Or they may be planned in such a way that most of their wards are noisy, unclean and unsanitary.

Highways and Streets.—The only land inputs involved in the use of land for highways and streets are the fixed inputs, interest and taxes; and since commonly highways and streets are public properties, even these are mostly left out of consideration. From the standpoint of public policy, however, land used in highways and streets should be economized the same as any other land. Land can be economized

by growing crops clear to the actual road surface, as in much of Europe; and by narrowing the space between curb and sidewalk, as in the congested portions of many cities. But is it advisable? What as to the output, measured in the convenience and speed of travel, of those who use the highways? What of the comforts of living along the streets? What of the upkeep costs of the road surface and costs of making repairs? The answers to these questions will depend upon the price of the land, the wages of labor, the importance to the population of the comforts and conveniences of living and travel. In a densely populated country, land will be economized much more than in the United States.

Land for highway use can also be economized by making the road-surface narrow. The advisability of this depends mostly upon the volume and type of traffic. If traffic is at all dense, the rate of travel will be so reduced as to increase the total cost per unit of traffic. The land element is probably one of the least costly of the elements involved. An offsetting influence of great importance is that the wider the streets are, the less room there is left for buildings, and the larger the area over which a given volume of business or number of residences is spread. This increases rapidly the distances that must be traveled from one place of business to another. Careful city planning requires a weighing of these countereffects. One of the difficult problems connected with it is that all planning must be for the future, and it is difficult to estimate what the needs will be a hundred years hence. Also future costs must be weighed against present costs. If plans are made on the basis of least costs fifty years hence, they will not give us least costs now.

Land used by highways of restricted use, such as railroad rights-of-way, usually has an interest and tax input to reckon with. There are also certain maintenance costs involved, such as for keeping the track-sides mowed and burned. Railroads can be expected to balance land inputs against other inputs so as to secure least cost per unit of output.

Parks and Recreation Lands.—In this discussion, parks and recreation lands are interpreted as being used in a production process. As a matter of fact, much of such land comes near to being used in direct consumption.

When land for park and recreation use is publicly owned, the problem is much like that of public highways. Land can be economized by crowding the visitors, but this will take away most of the benefits

for which the parks were established. Furthermore, the costs of upkeep are greatly increased. So great is the use given to some parks in our larger cities that it is difficult to maintain lawns upon them. On the other hand, every new park created adds so much to the distances which the population must travel to and from work and places of business, and to the road surface that must be maintained; and the larger the parks, the greater these effects.

In questions of this kind, the quality of the output is the all-important consideration. Either enough land must be used to save the individuality of the park; or the park may just as well not be established. Scenic effects must be preserved. Land utilized commercially for recreation purposes, such as baseball parks, amusement parks and the like, is likely to be utilized at something approaching a least-cost combination. Location is a very important consideration in establishing parks. Location in congested areas means greater use of the park; but also higher cost-rates for the land if it is a commercial enterprise, or the public equivalent of this if it is a public enterprise. Transportation facilities need almost to be considered as inputs; that is, the cost of getting to and from the park should really be combined with the cost of establishing and maintaining it.

Open-Pit and Placer Mines.—Shaft mines occupy only a few square rods of surface as sites for shaft-houses, power plants, stockpiles and the like. Open-pit mines and placer mines use areas of considerable size, and what is more, they may reduce them almost to the condition of being merely room and situation; or they may even convert them into water surface. The value of the ore in the land, however, is so much greater than the value of the soil on the surface, that the economizing of the former is practically the only consideration. Even cities have been moved for the sake of the ores beneath.

After all, it is the sub-surface materials that are mostly being appropriated in open-pit and place mining. The only difference from shaft mining is that the surface is appropriated also. This use of land is therefore in a sense intermediate between surface and sub-surface appropriation.

Wharves, Docks, Beaches, etc.—The only special circumstance connected with wharves, beaches and the like is that they represent a combination of land-surface use and water-surface use. Both the land surface and the water surface are necessary before such uses are possible. Both surfaces are economized, but especially the

land surface. There is a relatively limited amount of good shoreline well located and near centers of population. The location of the shoreline is of great importance; also its shape, direction and topography. Good harbors are scarce.

Sub-Surface Appropriation.—As already explained, the materials taken out of the earth's crust in mining operations can never be restored. But depreciation is not complete because the land surface is still preserved and can be put to the usual surface uses. The problem, therefore, is mostly that of the most economical utilization of the sub-surface materials. The first question is always whether the materials are worth the cost of extracting them—whether the output is greater than the input. The next question is how completely it pays to remove the materials—some methods of mining leave a good deal of ore behind, but are relatively inexpensive. In answering this question, future costs and prices must be weighed against present costs and prices. It now pays to remove some ores that it paid to leave in the ground twenty years ago. The third question is the combination of inputs that turns out the product at least cost. The problem of organization for least-cost mining is a complicated one.

An additional factor associated with oil wells and the like is that the underground supplies are not definitely localized. The same underground territory may frequently be drained at different points.

II. THE WATER SURFACE

The water surface of the earth includes the oceans, seas, lakes and rivers. The principal uses to which the water surface is put may be classified as follows: as highways of travel, for fishing, for floating logs, and for recreation other than fishing. Some of these uses come nearer to being direct consumption than production; for instance, fishing for pleasure, yachting, canoeing, etc. The most important production uses are as highways for travel, and for commercial fisheries. Most of the discussion which follows will have reference to these uses.

As with the land surface, the water surface as here interpreted includes the air and sunlight and all other natural associations; it likewise includes any under-surface that has economic significance.

Nearly all water surface, and all properties of water surface, are nature-made. But any artificial surface, such as an artificial harbor, or a canal, which behaves like a natural water surface, would be called water surface. There is always the probability that such reconstruc-

tions will depreciate and will require considerable upkeep, which may put them in the class of land (or water) reconstructions.

Properties of the Water Surface as a Highway of Travel.—1. *Does not depreciate from use.* In the course of time, rivers, lakes and harbors may fill with sediment and become unnavigable, but this will not be the result of use. It will rather be in the nature of *fixed depreciation.*

2. On the other hand, it does not *appreciate* from use. If it appreciates, it is from such things as increase in population and increase in volume of product to be transported. It may experience obsolescence for opposite reasons. Many a river lost its significance when the railroads were built.

3. *Immobile; but permits great freedom of movement and shifts in lines and direction of travel over its surface.* It also can combine travel use and fishing use without loss to either.

4. *Water surface is not ordinarily interpreted as having any inputs.* It is usually public property. Furthermore, it usually has no alternative uses—no other substitute uses to which it can be put. But land surface may be especially valuable because of access or use which it gives to water surface. If this is the case, then the water surface is responsible for some of the fixed land input. The owner of land affected in this way will find it necessary to utilize it more intensively in order to realize least-cost production.

It is also usually necessary to maintain lighthouses, signal services and the like; and this becomes a sort of fixed maintenance cost.

5. Except for such circumstances, the only inputs involved are those of the other production elements. Except in harbors and the like, there is very little chance of water surface being used to the point of diminishing output. The problem of economical utilization is therefore largely one of utilizing the other elements economically—boats, labor, fuel, etc.

6. *Location is of greater significance.* A navigable river means much more to a fertile country than to a barren one. Located near a coal mine, it may add millions to its value.

7. *The supply is limited in the same ways that land surface is limited;* but since diminishing output is seldom attained, this is not a matter of much significance.

Fishing Use.—First of all, a distinction must be made between natural fisheries and artificial fisheries. The former are much like lumbering enterprises; they represent the using up of a supply of

product that nature has already produced; and that use may be of such a nature as rapidly to deplete the stock. In general, nature comes nearer to keeping up the supply of fish against the inroads of man than she does to keeping up the supply of timber. Artificial fisheries are much like ranching enterprises. All that man does is to restock and protect from depredation, and nature does the rest.

Fishing waters can be rendered valueless for fishing purposes by polluting the water and the like; but under ordinary circumstances nothing of this kind happens, and as long as the waters remain, they are capable of being restocked and used again. They are therefore like land surface in this respect. They are also like land surface with respect to supply.

One of the important problems connected with artificial fisheries is the rate at which it is most economical to harvest the crop. Another is the number of young fish it pays to "plant." A body of water is capable of feeding only a certain number of fish to best advantage, and this limit is probably easily reached under artificial conditions. Another problem is that of the kinds of fish that can be combined to best advantage in one body of water.

With natural fisheries, the only other inputs are the labor and equipment used in the harvesting operations. With artificial fisheries, there is in addition the labor, equipment, etc., used in hatching and planting the young fish, and in protecting the fish from wasteful fishing. Public policy requires that all these factors be considered in determining when it pays to restock lakes and streams, and with what intensity.

III. THE ATMOSPHERE

There is very little purpose in discussing this portion of the earth: it exists in such abundance that seldom is any attempt made to economize it. The most important exception to this statement is the planning of buildings so as to give access to it. All production processes depend upon or actually use the atmosphere in some form or other. The most conspicuous examples of this are the uses of moving air currents by sailing vessels, windmills and the like. But of far more significance is the use of air by all forms of life. But this use of the air has been combined in the analysis with the land surface and its properties. The development of aërial transportation is giving to the air sphere a new significance.

IV. THE SUPPLY OF LAND AND WATER SURFACE

The area of the earth's surface is 192,200,000 square miles. This is divided between land surface and water surface roughly as follows: Land surface, 55,000,000 square miles, or 28.6 per cent; water surface, 137,200,000, or 71.4 per cent. In this division, the water surface of small lakes and ponds and rivers is included with land surface.

The land surface is divided between continents as follows:

	(Million square miles)
Asia	17.02
Africa	11.46
North America	9.26
South America	6.84
Europe	3.83
Australia	3.43
Other [1]	3.00
Total	55.00

Not over half of this area can be considered even as potential agricultural land. Probably five million square miles of it is desert that never can be irrigated. Another seven million square miles is too far north for agriculture. A still larger area is too rough or too high above sea level for growing crops. In addition, there is a large area of semi-arid land suitable only for pasture.

Figure XLI shows the utilization of the land area of the United States in 1919, according to careful estimates worked out by the Committee on Land Utilization of the United States Department of Agriculture appointed by Secretary of Agriculture Henry C. Wallace in 1921. Dr. L. C. Gray of the Division of Land Economics was chairman of the Committee.[2] The crops harvested in 1919 represented only 19 per cent of the land area of the United States. This is to be compared with 43 per cent in pasture of various kinds. Much of this pasture, however, is not very productive. The average carrying capacity of the 587 million acres classified as semi-arid and arid pasture is estimated at only one head of live stock for 24 acres, as compared with one head for five acres for the 231 million of acres of humid and grassland pasture. Of the 483 million acres classified as forest land, less than one-third is in virgin forest, and 81

[1] Polar region.

[2] See the *1923 Yearbook* of the U. S. Department of Agriculture, article by L. C. Gray, Raphael Zon and others, pp. 415–506, for the remainder of the data.

million acres are described as "cut-over and burned-over, not re-stocking." Of the 115 million acres of farm land not in harvested crops, pasture or forest, 25 millions are reported as "idle and fallow,"

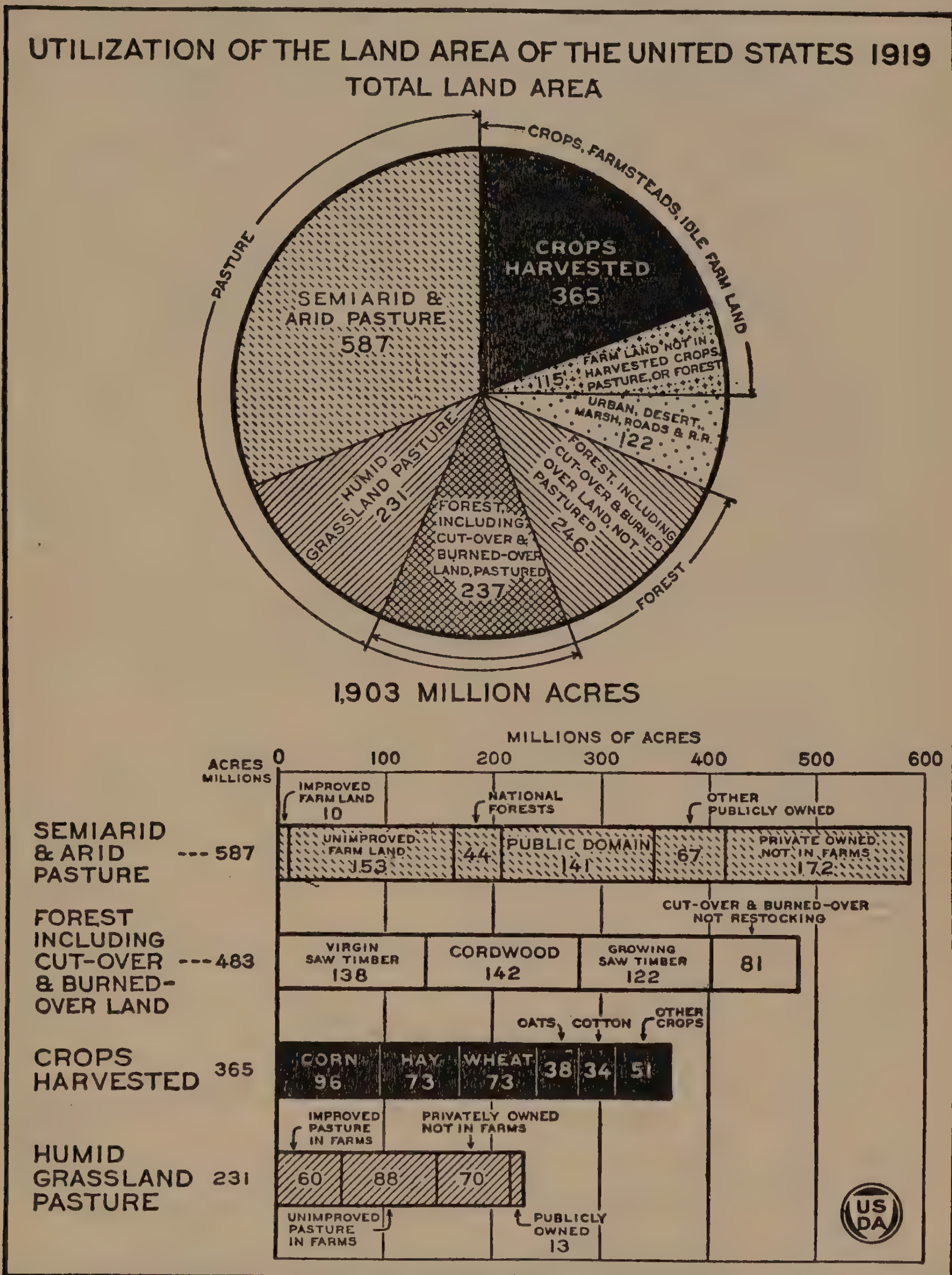


FIG. XLI. Utilization of Land Area of the U. S. 1919.[1]

[1] This diagram is Figure 1 of an article called *Utilization of Our Lands for Crops, Pasture, and Forests*, by L. C. Gray, O. E. Baker, F. J. Marschner, B. O. Wietz, W. R. Chapline, Ward Shepard, and Raphael Zon of the United States Department of Agriculture, See 1923 Yearbook, pp. 415–506.

15 millions as in crops that failed in 1919, 24 millions in farmstead, 10 millions in public roads, 3 millions in lanes, 6 millions in marsh lands, and the remainder, 30 million acres, in waste land or not used. Of the

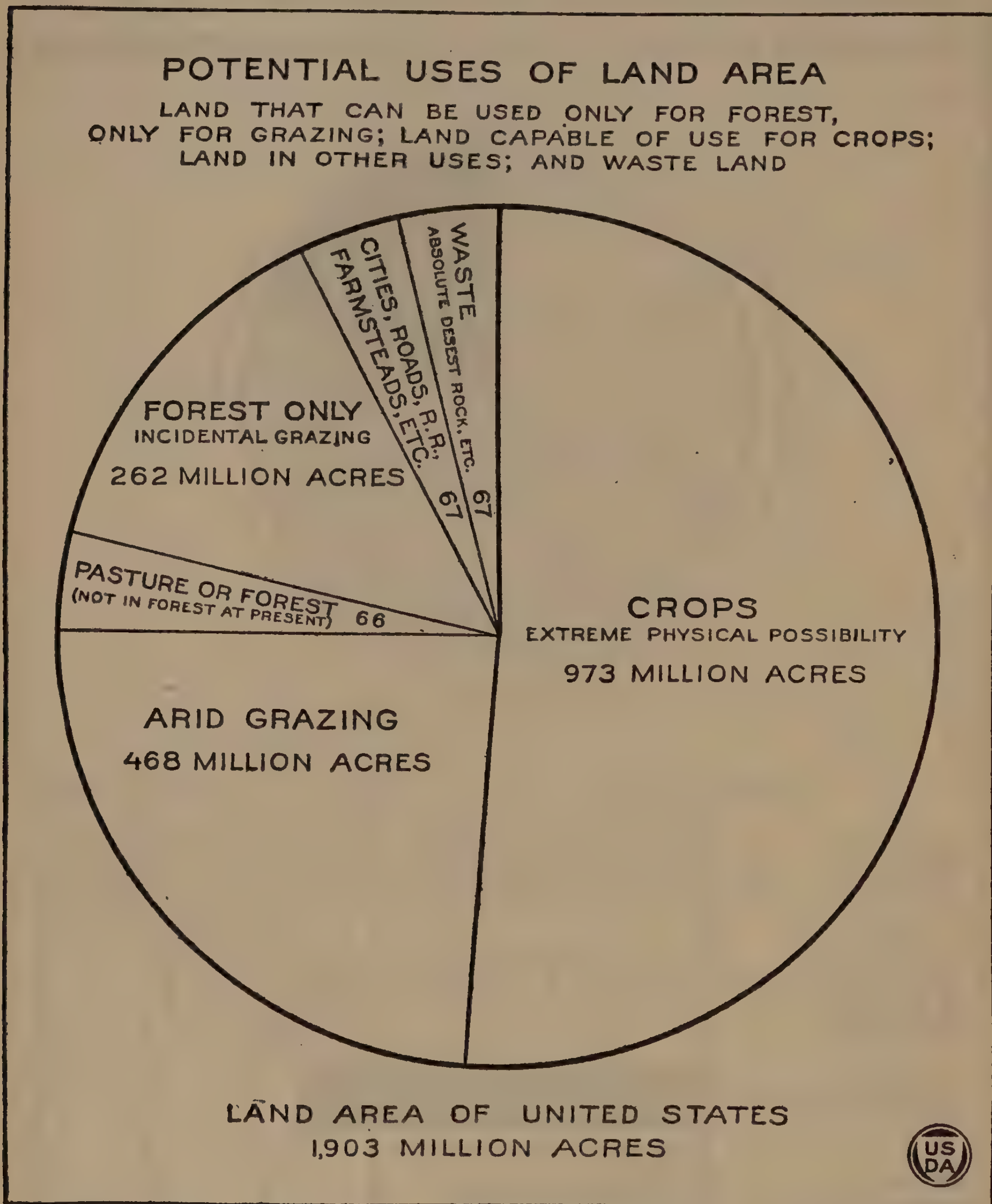


FIG. XLII. Potential Uses of Land Areas of the United States.[1]

122 millions of acres reported as not used for crops, pasture or forest and not in farms, 10 millions are occupied by public roads, 10 millions by cities and villages, 4 millions by railways, 6 millions by natural parks, 1 million by coastal beach, 14 millions by marshes, 20 millions by rock outcrop, and 57 millions by desert.

[1] This is Figure 12 of the previously mentioned article by L. C. Gray and others.

These data give a clear picture of the present utilization of our land. Figure XLII gives the Committee's estimate of the "potential uses" of our land area. A total of 973 million acres could be made into crop land. But some of this would be a very poor grade of crop land. The Committee points out, furthermore, that this would leave far from enough land for pasture and forest. The chances are, therefore, that at least half of the 608 million acres not now in crops that could be so used as a last resort, will never be so used.

Between 1910 and 1920, the acreage of land in farms decreased 7 millions in the Eastern states, but increased 84 millions in the Western states. During the same period, the land in crops increased 25 million acres in the Western states. These figures indicate that for the Western states it was a decade of reaching out and bringing previously considered sub-marginal land into farms, and for the Eastern states, a period of converting pasture and meadow land already in farms into crop land. Most of the changes took place after 1916. Considerable of the land in the Western states has since gone out of use again.

TABLE XXI. CLASSIFICATION OF LAND AREA OF 16 SELECTED COUNTRIES[1]

Country	PERCENTAGE TOTAL AREA		*Ratio arable to agricultural*
	Agricultural	*Arable*	
Denmark	67	61	91
Germany	67	43	63
Italy	85 F	43	50
France	64	42	64
Belgium	92 F	42	40
India	37	33	90
England and Wales	82	29	35
Ireland	83	24	28
United States	37	18	47
Japan	18	17	91
Switzerland	54	12	23
China	15	10	65
Sweden	11	9	76
Argentine	45	7	16
Union of South Africa	75	2	3
Australia	52	1	2

Table XXI is included to give some idea of the utilization of land in foreign countries. The countries are ranked in the order of their

[1] From an unpublished study by Carl R. Arnold prepared under the direction of the author. F = includes forests also.

percentage of "arable" land. The usual definition of arable land in most countries is land which is regularly tilled or mowed and cropped in rotation. "Agricultural land" as here used includes in addition land used for permanent pasture or permanent meadow. The countries with a low ratio of arable land run heavily to pasture and live stock farming.

SUGGESTIONS FOR FURTHER READING

The reader is referred particularly to Chapter II of Richard T. Ely's and Edward W. Morehouse's *Elements of Land Economics* (1924), for a discussion of the characteristics of land. These authors discuss land from other points of view besides production. L. C. Gray, O. E. Baker, and others discuss the potential uses of our land area in the article on *The Utilization of Our Lands for Crops, Pasture, and Forests* in the United States Department of Agriculture, Yearbook, 1923.

PROBLEMS

1. Write a definition of land.
2. Make a classification of land uses under the following heads:
   a. Land uses which depreciate the land.
   b. Land uses which may or may not depreciate the land.
   c. Land uses in which depreciation is independent of use.
3. Distinguish between land and real estate.
4. Some textbooks speak of the "indestructible properties of land." What are these?
5. Cite instances or cases where the appreciation and depreciation of land depend on (a) use made of land, (b) other factors.
6. What makes the principle of diminishing physical outputs work in a peculiar way in land use?
7. *Extensive* and *intensive* are terms often applied to use of land. What do they mean?
8. What questions are involved in calculating whether it is cheaper to own or rent a house in the city?
9. a. What are the factors that determine the kind of roads the public builds?
   b. Would the problem be different if roads were built by individuals and tolls charged?
10. Cities often condemn property and turn it into park. Is this a wise policy? What reflection does it cast on past policy?
11. Is the problem of street widening similar to the one above? Explain.
12. If streets were made four rods wide instead of three rods, what effect would it have on residence lots? Would city blocks need to be planned differently?
13. If cities were planned in advance instead of just growing, what effect would it have on size of lots? Terraces? Width of streets?

14. Why not rearrange a city to conform to some ideal plan?
15. Enumerate all the costs to a city population of maintaining a large park in the downtown district or near it. Also enumerate the advantages.
16. Does the law of diminishing outputs apply to the use of the water surface of the earth?
17. How would you analyze the problem of the number of shafts to sink to remove the ore from an ore body?
18. Water frontage is very limited at times. Is this a limitation of land surface or of water surface? How is the water frontage, in effect, increased in many ports?
19. Would you favor a government campaign to help people get out of the city and settle on the millions of acres of potential farm land in the United States? Why or why not?

CHAPTER XVI

THE HUMAN AGENT IN PRODUCTION

Our discussion of the elements of production has covered all except the most important one of them, namely, the human element, the *active agent*, the worker. Production is a science of combination, we have been told. It is the human agent that does this combining, plans it and actually executes it. This is because all production is for this human agent, in his behalf and for his benefit and pleasure. In an isolated self-sufficing economy, this was so evident that no one ever thought of it. Each act of production was definitely motivated by some human need or desire of the individual performing the act, or of some close member of the group or community. In the complex social order of today, in which a large part of the population is working under some one else's direction for a wage, on one small part of a product to be sold on the market, this product to be used in making some other product, and then perhaps this second product to be used in making a third product, then this final product to pass through many hands, and finally reach a consumer in some other part of this country or some other country, the worker is very likely to forget that he is still producing for his own consumption and to meet his own needs and desires; and he needs to be reminded of it constantly.

I. FORMS OF HUMAN EFFORT

Human effort in production takes many forms and may be classified in several ways. First, there is the distinction between *physical* and *mental* effort. Obviously this is not a hard and fast distinction. Practically all effort is a combination of them. In modern production, there is a large amount of work which requires less mental effort than men gladly give gratis. Many jobs in modern industry would be far more attractive if they would only give the worker some chance to exercise his mind in connection with their work. No doubt the operation of digging a sewer ditch has much more in it to enlist the mental faculties than most of the minute operations into which the making of a modern automobile has been divided. At the other extreme is a large amount of work which requires far less physical effort than is

good for the body. This is generally true of all the professional and clerical and business occupations. If some way could be found of dividing up the physical and mental effort of the world so that the manual workers could have as much mental exercise as they would like, and the brain workers could have as much physical effort as they need, the world would be immensely better off. The difficulty, as we shall see later, is that this objective conflicts with other objectives which for the present at least seem more important.

Another distinction is between *laborer*, *manager* and *entrepreneur*. A laborer is one who handles directly the materials worked on, the tools or machines worked with, and the supplies used up; a manager is one who directs laborers in this handling, and plans the business and lays out its activities from day to day. The term laborer is not a good one to use in this place, because in a sense all human effort is labor; but men commonly use it in this sense, and the dictionaries so recognize it. Thus Webster speaks of "the part played by the laborer, operative and artisan in the production of wealth, as distinguished from the service rendered by capitalists." For our purposes at this point, the term capitalist is equivalent to manager.

In actual production analysis, the distinction between laborer and manager is very important. There is a vital difference between the actual working with materials and tools, and the directing of others in the doing of it; between handling materials and machines, and handling men.

The principal difficulty with the distinction is that many men do both; they both work with materials and tools, and direct the labor of others. This includes the merchants in all the small establishment in the country; all the small shopkeepers, such as tailors, barbers, milliners; all the so-called managers of small manufacturing plants, such as creameries, laundries, custom flour mills; and all the farmers either employing labor or using family labor. One procedure is to put such persons into one category or the other according to which of their functions is the more important; which, as a matter of fact, is the usual way in the field of science. A more satisfactory procedure is to call them managers in all cases in which they do any directing of the labor of others and planning of operations. Another procedure is to call each of them by a special term, such as head-miller, head-trimmer, secretary-manager, buttermaker-manager, which designates the combination of functions. Also the practice is growing rapidly of calling all persons who thus combine labor and management as "op-

erators." We thus speak of the operators of stores, creameries, farms, etc. This term will be used frequently in this sense in the present treatise.

It should be pointed out that in all such cases as the foregoing, the manager actually directs his own labor as well as that of his employees. If this analysis is accepted, however, it follows logically that all the heads of all one-man shops and farms, and of one-woman households, must also be interpreted as managing their own labor. This, too, is in keeping with common practice. There is no reason why distinction should be made between the organizing and planning of the operations of a one-man shop or farm or household and that of a two-man or ten-man shop or farm or household. All are considered as management in the terms "shop management," "farm management," and "home management." In such cases, however, the planning of operations is the significant part of management.

It should also be pointed out here that although management largely involves the directing of the labor of others, it is by no means directly proportional to the number of laborers. The more equipment used by a squad of ten men, in most cases the more management required. In other words, machines require attention as well as men. They are not exactly managed or directed, but they must be selected, and then looked after carefully from day to day to see that they are working properly. The same is true of the other elements of production, of buildings, supplies and raw materials, although not to such an extent.

In agriculture, a large part of management would seem to be more directly concerned with equipment, live stock and growing crops than with the men employed. Also management is to some extent proportional to land—five men working on a thousand acres of land will take more management than five men working on a hundred acres. Thus the area aspect of land becomes significant in management, and the one-man farm may have important management problems.

The difficulty with calling the operators of one-man units managers is that few laborers working under the management of others can escape at least a little planning of their operations, and some must do a great deal of it. The sewer digger must mark off his trench. The carpenter must select his boards, determine how many and what size of nails to use, etc.; the bookkeeper must classify his accounts; the school teacher must make her lesson plans; the university professor must organize his courses. Some of these undoubtedly do much more

planning than the operators of some one-man units. The distinction is that in the case of the one-man unit, the person doing the work does *all the managing that there is to do;* in the case of the sewer digger, some one else did the measuring and selected the materials and is responsible for the job; in the case of the accountant, some one else planned the business which the accounts serve, and interprets them and is responsible for their accuracy; in the case of the university professor, some one else planned the curriculum into which the particular course fits, and is responsible for its effectiveness. The management of a small enterprise is none the less management even though it is simple. Some members of the dog family are smaller than some cats; but they are none the less dogs and not cats.

Managers have many designations these days; there are plain managers and general managers and assistant managers; there are factory managers, sales managers, and traffic managers; personnel managers; floor managers; district managers. Then there are superintendents and assistant superintendents; division superintendents; foremen; overseers; shift bosses; chief clerks; chief inspectors; head salesmen, etc. The officers of corporations are also managers.

The foregoing discussion has made clear the difference between *labor* and *management,* even though both are frequently performed by the same person. It is more important for many purposes to be able to say that certain activities are labor or management than to classify the person doing them. In the discussion which follows, the terms labor and management will therefore be freely used.

Thus far nothing has been said about the designation *entrepreneur.* Managers are of two kinds, hired managers and *those who manage their own businesses. The latter are entrepreneurs.* Every man is an entrepreneur of his own personal affairs, is joint-entrepreneur of his household; but in his occupation he may be a laborer working under the management of others, or a manager of some kind working under the entrepreneurship of an individual, a partnership or a corporation. Every farmer, merchant and shopkeeper in the land is an entrepreneur; every independent doctor, dentist and lawyer; every wholesaler, broker, jobber and commission merchant; also every factory owner, whether an individual owner, a partner, or merely a stockholder. Stockholders themselves do little actual managing. Most of it they delegate to the officers whom they elect and the managers whom they hire. They do most of their managing when they vote.

The distinguishing feature of the entrepreneur is that he is responsible

to no one but himself for the outcome of his enterprise. He therefore represents a unique classification. The only persons who are both hired managers and entrepreneurs are the officers of corporations and hired managers who are also stockholders. Laborers may be stockholders also.

The three *forms* which human effort takes in production are therefore *Labor*, *Management*, and *Entrepreneurship*.

II. THE PROPERTIES OF HUMAN EFFORT IN PRODUCTION

Later in the chapter, we will consider human effort in its three forms. This section will point out certain characteristics common to all forms:

1. *The human agent appreciates and depreciates in a special way.* The student should go back at this point and re-read the discussion of the way in which workstock appreciates and depreciates, for viewed from a purely physical standpoint, there is very little difference between the appreciation and depreciation of labor and the appreciation and depreciation of workstock. To illustrate this, let us reconstruct in our minds for an instant a condition of human slavery. It is probable that the human animal would be analyzed in a slavery economy very much as the horse was analyzed in an earlier chapter. We would say of him that he appreciated in his youth and then depreciated, that the appreciation continued to the point where it was offset by the decrease in latent productivity; and that from this point on, all was depreciation. We would say that he increased in productivity until the prime of his life, but not in value, because some of his potential usefulness was already spent. We would also say of such a human animal that any effort devoted to training him at any time in his life would make him more useful, and unless offset by depreciation, would cause him to appreciate. We would say further that most of the depreciation was fixed, that the human animal would grow old whether he was worked or kept in idleness, and that only very heavy work would shorten the period of his life. We would also consider the phenomenon of fatigue and restitution, and the rate at which each takes place with different intensities of use, and the particular intensity of use which gave the best utilization of the animal's powers in combination with the other elements of production.

Now as a matter of fact the foregoing is a nearly true description of the way in which the human agent appreciates and depreciates. It is perhaps a difference that an individual may continue appreciating until middle life. Even though years that might be productive are

spent without yielding a product, he may be appreciating because in later years he will more than make up the early deficits by reason of the training he received earlier. This is because of the tremendous accomplishments of specialized training of the human animal. The individual may also turn out a considerable output and yet appreciate at the same time—this will be true of anyone who is developing "on the job."

2. The principal difference between the human agent and work-stock in the respect mentioned is not a matter of biology, but of social arrangements, in particular of the institution of *personal freedom.* In the ordinary sense of the term, *human effort cannot be owned by somebody else.* The laws do not even enforce an agreement to do work. If I hire you to work for me a month and you tire of your job and quit in the middle of some fine morning, I cannot make you come back and go to work. That would be called "enforced servitude," or slavery, or "peonage." Of course actually the laborer is not as free as this—he frequently needs his job in order to support his family, and may continue working even though he does not like the treatment he receives; or his chances for advancement in his chosen field force him to keep in line and do as is "suggested." But to all is accorded at least some measure of choice. There are always alternatives, although they may not be pleasant to behold. And the employer of labor no matter how much advantage he may enjoy from the "nature of things" or economic circumstances, is never able to constrain his employees beyond a certain point, and never certain of their future conduct.

One important consequence of this is that employers cannot be expected to go very far in training their employees. For no sooner may they have them trained than they may quit and go to work for a competitor. Employers actually do a good deal of training of employees. In many cases, they have no alternative, as only trained workers are of any use to them for some operations, and they have no recourse except to train them and then treat them so that they will want to stay. Employers of such labor usually put the wages low enough while the men are being trained, so that they can raise them afterwards. In other cases, they expect to benefit as much from the trained men who come to them from other employers as they lose from those who desert them.

We have already learned how our manufacturing industries have developed a system of minute division of labor which makes it very

easy to break in a new man at a new operation. This is in part a consequence of the forcgoing circumstances. If employers could have kept their skilled workers, they would have been slower about developing a substitute for them.

3. In general, any training which individuals receive to make them more productive must come of their own initiative, assisted by public aid. We have come to realize that under a system of personal freedom such has been described, our principal hope for having a trained body of workers is in the individuals themselves, and that the individuals will not train themselves properly without a great deal of public aid, encouragement and supervision. We have therefore come to look upon education in all of its forms as mostly a public function. No one is constrained to obtain an education, except a modicum of it in the compulsory-attendance years. But each person is free, in so far as his economic circumstances permit, to obtain the amount and kind of training to which his social inheritance and environment and personal bent dispose him, and for which his personal abilities qualify him.

There is another phase of the institution of personal freedom. If I desire to go to school until I am thirty, endeavoring to make myself more useful, then probably I am appreciating all the while, even though I have spent many years that might have yielded a surplus product. If I decide instead to be a bricklayer, I shall probably begin yielding a surplus before twenty. But all the surplus I yield before thirty may be offset by one year of service that I render as a physician or lawyer or engineer after I am thirty. I have such a choice to make, subject to the limitations already mentioned. My appreciation and depreciation are therefore in my own hands very largely.

We must not get the idea that the appreciation of the individual is wholly a matter of formal education. As a matter of fact, it is mostly something else. All that the individual receives in the classroom and laboratory is a good start. It can be said of most occupations that there are two types of training required for it, one type consisting of an understanding of the fundamental principles underlying the business, and certain skills that are best acquired under competent instruction by specialists in that field; and the other consisting of facts and skills that are best acquired while at work. There are certain principles relating to money and credit and exchange that all bankers ought to know; but which they would not learn in many banks in a hundred years. The place to learn these in the first instance is in school. The application of these principles to the numerous and varied concrete

situations that arise in the practical administration of a business, can, however, be made only while actually at work in a bank. All that there will be time for in school will be a few of the common cases. The individual who has been properly trained in school will study each situation that arises at the bank in the light of the principles he has learned in school, will constantly look about him for further aids in interpreting old problems and new problems that arise, will even go back to his old textbooks and read them with a new vision. Such an individual will develop in productive powers as rapidly after he leaves school as while in school. There are also numerous facts about the business world and details of business practice that vary from time to time, and from place to place, that cannot be taught to advantage in school. The place to learn to do such things as count money and make out drafts is obviously in the bank and not in school. Hence appreciation in the human agent in production may continue long after work begins. It may cease in one position, and resume with a more advanced one. So long as the latent productivity of the individual—the total product still to come from his brain and hands—is not diminishing, he is holding his own or even appreciating. And if human effort could be purchased by lifetimes, as much or more would be paid for it at the end of the year than at the beginning.

4. The arrangement under which human effort is engaged greatly affects its behavior in production. Human effort may be hired for a wage, or may work entirely under its own control. Profit-sharing and bonus systems represent attempts to combine the two foregoing arrangements. Human effort may be engaged at a fixed rate per unit of time, that is, per hour, per day, per month, or per year; or it may be hired "by the piece," that is, at so much per ton, or per hundred garments, or per dollar of sales; or it may be hired by the job, which is really a piece-rate. Or there may be a combination of time-rates and piece-rates—such as a guaranteed salary plus a commission on sales. If hired on a time basis, the contract may be for a day, or a week, or a month, or a year, or any longer period. As already explained, such a contract is usually not enforceable in a legal sense against the employee.

Let us consider first the human effort which is hired for a wage or salary. Ordinarily all that the employer is interested in is the productivity of the employee during the period for which he is hired. Appreciation and depreciation are therefore not concerns of his, but of the individual who engages himself to work. If the job is one which gives

the individual a chance to appreciate while working, or the employer agrees as part of the bargain to provide certain opportunities for the development of the individual, the wage rate is likely to be lower. The employer has no surety that the individual will contract with him for another year, or in many cases even work out his present contract. Hence he must pay during each contract period according to the productivity of the individual during that period. The situation is thus the very opposite of that of a machine. One who buys a machine buys all the future uses of it. If he gives a machine good care this year, it will be more useful to him in later years. If he misuses it, the opposite will be the case. Depreciation is in this case the concern of the owner and user of the machine. As a matter of fact, however, employers actually do concern themselves in many cases with the appreciation and depreciation of their employees. One of the reasons for this is that they expect that many of their employees, especially those holding the more important positions, will remain with them indefinitely. They could, it is true, refuse to reëngage their old employees after they begin to decline in productivity or could reduce their wages; but such a policy would react disastrously on the morale of the present employees. Hence they may find it wisest to assume that their employees are permanently attached to them, and hence to concern themselves in their future as well as present productivity.

Accident and disability compensation laws actually force employers to consider the future productivity of their employees, but only in a special way.

An individual working entirely for himself, at the other extreme, is exactly in the position of one who is using a machine or horse which he has purchased. His body and brain is a machine of which he hopes to obtain the fullest use over the whole period of his life. To attain this objective, each use that he makes of it must be considered from the standpoint of its effect on depreciation and appreciation. How large a portion of the usual period of his life will be consumed by it? Will it make him more or less productive for future undertakings?

Any individual who hires out his services for a wage is from his standpoint planning his life-work the same as one who is working upon his own enterprises, and must consider the same series of effects. The only difference is that he expresses his judgment as to the net worth of what he is giving and receiving in the form of a wage rate, whereas the man who works for himself expresses it as a sort of necessary return from the enterprise before he will embark upon it.

5. The individual planning the utilization of his own latent productivity in most cases does not plan it as consciously and deliberately as the foregoing would indicate. He has a life to live as well as work to do, and not all of the comforts and pleasures of living from day to day are sacrificed for the sake of a larger total product in the end. Some make the choice largely in terms of the future; others largely in terms of the present; and there are all gradations between. Moreover, each individual is a bundle of acquired habits which predispose him to act in a certain way in every case in which he does not stop to think and choose deliberately. Some modern psychologists of course go so far as to say that his thinking is all predisposed. Fundamental to these habits is the instinctive equipment of the individual—not so important as with the lower forms of life, but still important enough to affect human conduct somewhat.

Hence, although the individual is free in principle to control his own appreciation and depreciation and plan his own career, actually he is far from being a free agent, for several reasons more or less interrelated, which may be designated as follows: First, his economic circumstances may prevent him from doing as he would; second, his surroundings and the ideas and attitudes he has acquired from his surroundings, particularly from his home, predispose him to act in certain ways; third, the foregoing, in combination with his own particular experiences, have developed in him habitual responses to the events of the day, and these project his past into the future; fourth, his instinctive equipment, handed down to him from generations of forebears, moulds his daily conduct by selecting his habits.

6. The principle of diminishing output works in a special way in the case of human effort. Let us consider first the case of hired labor. In the ordinary situation, the employer has no fixed labor inputs to consider. The wage paid covers everything. One principal variation from this arises from fluctuations in volume of business, especially daily and seasonal fluctuations. Some employees are engaged in advance and kept on the pay roll during slack as well as busy season and in dull times as well as prosperous times. This is especially true of the officers and managers and the regular office force. In such circumstances, salaries amount almost to fixed inputs. The salaries have to be paid even though business does fall off. If the fluctuations are of a regular or seasonal type some portion of such a pay roll can properly be charged only to the peak-load output, for it is only because

of the peak-load output that some of the help is hired by the year. The principal application of this to ordinary labor is that day and month rates are high enough during busy periods to recompense the worker for his idleness or low wages at other periods. Part of the high wages paid at rush periods are therefore really fixed inputs. Unemployment insurance is a system designed to pay workers some of their income during slack periods. If a satisfactory system of unemployment insurance could be devised, it would reduce wages at rush seasons.

When labor is hired on a time-rate basis, obviously the more work that the employer can get out of his labor in a given period, the lower his labor costs per unit of output. The wage can therefore be looked upon as in a sense fixed—the problem is to get the largest output per wage input. One way to get a larger output is to use more machinery or better machinery, or build a better plant. But these may cost more than to hire more labor. Obviously a least-cost combination is involved, the location of the point depending upon the wage-rate and the cost of the buildings and equipment. Another way to get a larger output is to speed up the machinery, thus increasing power input and raw materials input. In addition to the extra power cost involved in this are also the increasing amount of raw materials wasted, the increasing depreciation and maintenance of the equipment, and the deterioration in the quality of the product. Here again is a least-cost combination. A point is soon reached in this speeding-up process where the cost per unit of the same quality of product increases. Also the employees realize that they are working harder, and unless times are dull and jobs hard to find, will demand more pay. Thus the increasing wage-rate with larger inputs of raw materials and power becomes an additional factor in determining the location of the least-cost combination. In some cases it turns out that the workman cannot work as many hours at the higher rate of speed, and hours are shortened at the same rate per day.

The same results as the foregoing are also obtained by improving the organization of the work, keeping everybody busy all of the time, never having anybody waiting for materials or supplies, or for the other fellow to finish his task; always having enough help for each operation, and also not too much; having the workplace conveniently arranged, etc. By such means is output per unit of labor input increased particularly in the contracting trades.

When labor is hired on the piece-rate basis, the wages paid are

apparently variable strictly according to output. In some cases, however, the piece-rate has to be varied somewhat according to the volume of work to be done; and no doubt piece-rates are higher for industries of a seasonal nature than for industries with a steady output. The reason for this is that workers must earn a large part of their annual incomes during the rush periods. Piece-rates are no doubt varied according to input and output per unit of labor. A conveniently arranged plant with first-class equipment may pay lower piece-rates than a plant of the other sort. Also the speed of operation influences the piece-rates. One of the principal complaints which laborers make against the speeding-up process is that employers tend to lower the rates so that they earn very little more than before. In many cases, some lowering is no doubt necessary and proper, since other inputs may have been increased.

As already explained, employers cannot always entirely ignore the depreciation and appreciation of their labor force. A certain way of utilizing them may make them constantly more productive without lowering their usefulness in the farther future. Another way of utilizing them may wear them out rapidly and impair their future usefulness. Because some part of the labor force is more or less permanent, if for no other reason, the intelligent employer will consider future as well as present productivity.

When a man is working for himself, in one sense nearly everything is largely fixed. His depreciation is fixed, except as he may increase it by overworking. His maintenance is nearly fixed—the only sense in which it is not is that those who work hard are likely to hire more personal service and the like so as to give them more time for work. But in another sense, very little is fixed. To begin with, the individual does not have a definite unvarying amount of effort which he puts forth. The amount of the reward for this effort affects the amount which he will put forth. In prosperous times when profits are high, entrepreneurs will put forth more effort than in dull times. On the other hand, they will put forth still more effort in times of stress and imminent bankruptcy than when business is sailing on a steady keel. The effort put forth also depends upon the condition of the individual's health, the state of his mind, even the whims and fancies of his day and hour. To-day a business man may resolve to apply himself vigorously to his business and make it outstrip all its competitors; to-morrow he may decide upon a fishing trip. Then there is the further circumstance that the individual works under a light

load with little inducement, and that as the load increases, the inducement must increase rapidly.

If we could assume that an individual's effort was a fixed amount, the problem could be solved by assuming the individual as fixed, and applying increasing amounts of the other elements—land, labor, equipment, etc.—to him. The additional inputs of these would, in the first place, have to return more than they cost. One would not employ additional land and labor if they did not increase the value of the total output more than they cost. In the second place, they would have to add enough more than they cost to the value of the total output to induce the individual to put forth the extra effort required for looking after them. There are some difficulties with this method of attack. The first is that the surplus which must be added above the cost of the inputs increases as the load increases. The second is that it varies with the condition of the individual. The third is that the size of the surplus depends upon the prices of the product, and the cost-rates of the inputs. For all these reasons, it is difficult to forecast the amount of effort an individual will put forth, or determine how much he should put forth. It is very much a problem for each individual to solve for himself. The individual should, however, understand all the factors in the problem.

Such an analysis will no doubt seem very mechanical and unreal to many readers. They will say that none of us has a definite amount of inducement which he requires for a given amount of effort, that the effectiveness of our effort varies tremendously from day to day, and that our reluctance to put forth effort is uncertain and varying. All of these statements are most decidedly true. But they do not make the analysis entirely useless. Businesses are not organized one day and then reorganized the next because the entrepreneur did not like his breakfast. In the course of a year, or if one year is not enough, take five years, an entrepreneur has a chance to decide whether his business is making heavier drains upon his time and energy than he thinks is worth while in view of the returns he is getting, and to adjust his inputs and outputs accordingly. He may not even make a conscious decision—he may simply drift into a combination better suited to his condition—or his business may take him there as a result of the way in which he handles it. If his business is taking more energy than he cares to give it, he is likely to neglect it and it will surely decline. In these ways, the day-by-day reactions of the entrepreneur to his business are finally weighed out and his business

is adjusted to him. There has been no conscious reading off of any inputs and outputs on a scale beam; but the measuring has been going on just the same.

There are the same objections to make to speaking of the output of human effort in definite terms. The product of human effort is measured only partly in money income. The satisfactions arising from having achieved, or from having won the respect of one's fellow men, or from having attained power over them, or from having created a work of art, or from having built up an organization, or from having rendered service to human kind, may far outweigh mere money income. As a matter of fact, the product is as hard to measure as the input. But in the same way over a period of years the product does get measured out and balanced against the effort. Some decide, or drift into feeling, that "the game is not worth the candle;" and some decide very much the other way.

Naturally there are wide differences between individuals with respect to both the effort input and the output. With some, the effort line rises sharply; with others slowly. With some, money income is almost the sole consideration; with others a relatively minor consideration. Most of the successful men of the world have had a slowly rising effort input line, or a relatively low appreciation of mere money income; or, more likely, both of these.

As already indicated, the man who is working for a wage is master of his own destiny the same as he who works for himself. He has an input line and a product line the same as the entrepreneur. He consciously or unconsciously weighs these every time he makes a wage bargain; and he weighs them day-in and day-out on the job, mostly unconsciously, as he drifts into a certain degree of intensity with his work. Some drift into an easy careless way of working and let the years slide by; others are "on their toes" day after day striving for more speed, more skill or more understanding, and reaching out for better opportunities. With some, the product line includes a large amount of the joy of working, of the pleasure of creating something, and of the pride of good workmanship. Others are merely timeservers. The effort input is also affected greatly by working conditions, the disagreeableness of the work, and other similar things.

7. It will be apparent by this time that the behavior of the human agent in production is much more sensitive to environment, working conditions and the like than any element thus far studied. As the growing plant is more sensitive than the machine, and the animal

than the growing plant, so is man more sensitive than any animal, and by a wide margin. With man not only do environment and working conditions have to be considered, but objectives and life-purposes. For the first time do we have to deal with psychology, at least in its social and human form. By a proper handling of his working force, one entrepreneur may keep his men enthusiastic about their work, reduce his labor turnover to a minimum, and reduce his labor costs per unit of product although increasing wages. Another may so fail to understand the psychology of labor that he is constantly threatened with strikes and sabotage, and constantly rising costs. No system of hired labor altogether takes the place of having each man work for himself. In agriculture, the small family-sized farm wins out over the factory system in most cases. One of the great problems of the future for all industry is the developing of a labor system which will give us most of the advantages of large-scale factory production, and at the same time most of the advantages of having each man work for himself.

8. Capacity and efficiency in the human agent are far from being constant. The capacity of a machine is practically constant until it begins to wear out. Its efficiency is almost equally constant. The capacity and efficiency of labor, management and entrepreneurship are not exactly the same any two days in succession, fluctuate greatly from year to year, and are subject to considerable effected change both over a period of time and from day to day. Men increase their capacity and efficiency both by taking training and by developing them while at work. A common way of acquiring more capacity is to take a job too big for one and then "grow into it."

The differences in the make-up of individuals that give them high or low efficiency or capacity are very little understood. Of two men, A may run a small grocery store more efficiently than B, and yet fail when it comes to running a larger store, at which B would succeed. Perhaps A's close attention to details is necessary for the operation of a small store; but a weakness in the manager of a large store. The manager of a large store has no time for such things, and delegates it to employees. Perhaps B, on the other hand, is able to select men and direct them, whereas A is not. But what differences in mentality or habit of mind or personality are responsible for this? Is it a matter of memory for details, or quickness in thinking, or manner of speaking, or what? Any explanation is bound to be involved, for this simple reason if for no other, that there is such a multitude of tasks, with such

a wide range and variety in requirements, which a man may conceivably be called upon to perform.

9. Securing the right combination of capacities and efficiencies in labor and management and entrepreneurship is one of the major problems of all production. The chances are that most of us are working under more or less misfit conditions most of the time. Capacities are hard to fit, in the first place, because there are many jobs too large for one or two or three and too small for a large number. Division of labor in factories relieves this difficulty in large part, but not altogether. There are some jobs in factories that do not need all of one man or two men, but cannot get along with less. Division of labor actually creates some of these jobs. One of the principal reasons that efficiencies are hard to fit is that efficiencies for different tasks are not easily recognized. The modern science of production is busy developing methods of testing men for efficiency and capacity for different tasks, but there is still much experimenting and studying to be done. In the meantime, the method followed is that of "trial and error," of "guessing" that a certain man is suited for a certain task and then trying him out to see. Even though he may seem to fit well, he might fit some more important task still better.

Fitting managers to tasks is even more uncertain than fitting laborers. A story is told of a manufacturing firm looking for a man to replace its retiring general manager. This firm had two heads of "production departments" who had served very efficiently in this capacity, both of whom it tried out as general managers with disastrous results. It then tried out a younger man from the sales department with no better results. Meanwhile in this period of turmoil through which the firm was passing, more and more dependence had come to be placed on the office manager who through it all had kept the company's records straight and had kept the office functioning efficiently. And so one day when one of the directors suggested only half in earnest that maybe G—— ought to be considered, all the others fell in with the idea, and G—— was given his chance, and was successful from the start.

Entrepreneurs do their own fitting of themselves to enterprises, and a sorry job they frequently make of it. One of the reasons for this is that men are prone to overestimate themselves, or they fail to recognize certain of their limitations. Another is that many lack the capital to undertake enterprises for which they are fully capable; or lack the courage or initiative to start out for themselves. On the

other hand, some fall heir to enterprises that are more or less than they can manage.

10. It is commonly said that human effort is completely perishable. What is meant is that a day's labor lost through unemployment and the like can never be recovered. This is not strictly true—the rest frequently puts the worker in a position to accomplish more subsequently, even to make up for lost time by overtime if necessary—but it is true in the main. Such a statement is merely a corollary to the previous statements as to human effort and fixed depreciation.

11. The mobility of labor also comes in for a great deal of discussion. There is a considerable fringe of the labor supply which is largely free to move where it will. This includes especially the single men without property. The only costs of moving such labor are railway fare and time lost in moving. The principal causes of immobility of such labor are ignorance of better places to work, desire to remain among relatives and friends, and lack of initiative. For one large class of laborers, the migratory casual laborers who flock to the harvest fields in the summer, to the lumber camps in the winter, with all sorts of odd jobs in between, home ties and the like are no obstacles. Married men with families are much more tied down, but still manage to move about a good deal at times. Even the most fixed of them can at least make one move in their lifetimes if occasion demands it; say, from the farm to the city, or from the city to the farm, or from a small city to a large one. Such migration is constantly going on, of married men as well as single men. In the year 1924, according to an estimate made by the U. S. Department of Agriculture, 2,075,000 farm people left the farms for cities in the United States, and 1,396,000 left the cities for farms.[1]

Another cause of migration is the dying out of certain industries in one place and the springing up of the same or other industries in another place. Miners move about a great deal for reasons of this kind; also the factory workers of small cities.

In cities of any size, workers are comparatively free to seek work elsewhere in the same city, perhaps even in the same industry, usually without having to move their families.

The higher types of workers, those employed in management and entrepreneurship, are not usually so free to move. For one thing, they are likely to be tied to property of one kind or another which they cannot easily sell. This statement does not apply to that highly specialized form of entrepreneurship which consists in holding shares of

[1] *Report of the Secretary of Agriculture*, 1925, p. 50.

stock. It is the essence of such entrepreneurship that the entrepreneur can live almost anywhere.

It is thus apparent that as compared to land and buildings, and even as compared to most machinery and equipment, labor and even most management, are relatively more mobile.

That they are not completely mobile, however, is evident from the fact that wages for the same class of work are not the same in cities even in the same territory when differences in living costs have been taken into account. Factory towns less than a hundred miles apart may at any particular time be paying wages 10 to 20 per cent apart. Carpenters' wages may differ by more than this amount.

12. Differences in wages at competing points are not solely the result of a certain degree of immobility. They result in part from the fact that many forms of labor are specialized—not as specialized as machinery; it is true, but still not as free as most lands or many buildings. Common labor is comparatively free to shift from industry to industry; and the same is becoming increasingly true of ordinary factory labor, due to the increasing use of machinery and the minute division of tasks. It is the skilled workers and trade workers of all kind, and the professional people, who are highly specialized. Farming is on the whole rather specialized. Farmers can take up common labor without difficulty; but many of them would be going below their level to take up common labor just as would a plumber or a carpenter.

13. The conditions determining the supply of human effort are peculiar in many respects. From the world point of view, the supply of human effort depends upon the birth rate and death rate, and the willingness of the population to work. From a national point of view, it depends in addition upon immigration and the laws controlling it. From the point of view of an industry or profession, it depends upon the number of young people growing up in it, or being trained for it, and the number shifting to it from other industries or professions or out of it. From the point of view of a locality, it depends upon the birth rate and death rate in that locality, the number moving in or out, and the willingness of the population to work.

For the ordinary occupations, there is scarcely any limit to the number who can shift to them providing economic conditions warrant it, and time enough is given to make the shift. If agriculture could be made twice as efficient as it is, greatly reducing the number of people needed to produce our food or clothing, there could be a tremendous migration to the cities in one generation. The automobile in-

dustry seems to have attracted its quota of workers as rapidly as it has needed them.

For the higher pursuits, however, such is not the case. Talent is not reproduced readily in men any more than in cattle. Thus it is that men of unusual ability are highly rewarded. The differential between human capacities and efficiencies is a very wide one, and the returns are in proportion.

One expects new machines to be manufactured as rapidly as they can justify their existence by turning out a product as economically as it can be turned out by any other means. One expects the same thing of horses and cattle. With human beings, the conditions of supply are somewhat different. More human beings are brought into the world for the sake of human beings. Man is the final objective in the world. The choice is not between men and machines, or machines and horses, but between more men and less output per man, and fewer men and more output per man—between a larger population and poorer living, and a smaller population and better living. But although these are the alternatives, it can hardly be said that a choice is made on this basis. The increase in the population, and hence the supply of human effort, is a matter of the balance between the birth rate and the death rate, and both of these are far from being matters solely of deliberate choice. Hence the population may continue to increase, and comforts and satisfactions decrease, even though the people as a whole might wish otherwise.

14. Obviously the rôle of the human agent is greatly influenced at every turn by social considerations of many kinds. All that we can do here is to list a few instances of these. Laborers, for example, can organize into unions, making it necessary for employers to deal with them by groups rather than as individuals. Influenced by the policies of the group, the individuals composing it are sure to react in a different way to policies of their employers than they would if unorganized. Again, society as a whole is interested in the health of the worker and his family, and is sure to concern itself with production practices that have harmful effects upon the worker. All progressive countries have laws on their statute books governing the conditions of labor in factories and mines. Again, a great deal of social esteem or its opposite are attached to certain occupations, and determine in large part who shall enter the various occupations, and how they will conduct themselves afterwards. In this country at present, the white-collar occupations are relatively over-manned, and the manual trades under-manned.

III. LABOR

There were in the United States in 1920 about 28 million laborers. This does not include the 6,108,000 farmers who were entrepreneurs as well as laborers, nor three or four million other small entrepreneurs, such as small retail dealers and shopkeepers, lawyers, physicians and the like, who put in much more time at actual physical or mental labor than at planning and supervising. Of the 28 millions here classified as laborers, 4,179,000 are farm laborers, 912,000 are miners, and 210,000 are engaged in lumbering. Of the farm laborers, nearly half are members of the family helping the proprietor on the home farm. Of the nearly 12,000,000 laborers engaged in manufacturing and mechanical pursuits, probably 30 per cent are best classified as common "unskilled" laborers, about two-fifths as "semi-skilled," and the rest as "skilled."

The essence of labor as here defined is that it is directed by some one else, takes orders from some one else. Ultimately that some one else is the employer, the entrepreneur. When labor engages to work for an entrepreneur, it grants to him authority to direct its activity. Labor can quit any moment it sees fit so far as legal compulsion is concerned, but as long as it remains, it must submit to direction, or stand ready to be discharged.

This relationship between employer and employee appears to some unnecessarily harsh, and many are to day seeking for some modification of it that will give the worker more of a voice in the planning of his activities. An early proposal for this took the form of "coöperative workships." To-day we hear more of the "democratization of industry," of plans by which the worker is given representation on councils and committees of various kinds. The attitude of many employers is naturally that the undertaking is theirs, the responsibility is theirs, the plant in which the men are working is theirs, and likewise the equipment and the raw materials; and that, in consequence, they must have full control over every detail. There is a growing tendency to recognize, however, that the worker has something of an equity in his job, that he even has or should have something of a retained interest in the product. If the entrepreneur can say, "It is mine, I made it in my own factory," he can say, "It is mine, I made it with my own hands." To be sure, he sold the product of his hands when he sold his labor. But did he sell all of it, absolutely all of it? Surely not so in the case of the architect who plans a beautiful building for a wage—

that building will always stand as a credit to him even more than to the man who hires him. Is there not some small measure of this present in the automobile that comes forth from a factory the product of a thousand hands? Or if there is not, should not industry be organized so that there is?

It is generally admitted that present relations between employer and employed are unsatisfactory, especially in the larger manufacturing establishments and in mines. One conceivable way of remedying the situation is to endeavor to reëstablish all the old rigors of the master-servant relationship. Although there are those who would prefer this, few indeed consider it feasible. The flesh can perhaps be coerced; but not the spirit—and unless the spirit be in it, the labor will be without profit. A more promising field to cultivate is that of coöperation with the worker in solving their common problems, recognizing the interest of the worker in the enterprise and the product, and building upon it and using it to their common advantage. To succeed in such a program requires a better understanding of the psychology of the worker than is now commonly possessed.

Most of the properties of labor as an agent in production have been presented. A general description of the human agent in production more nearly fits labor than it does management and entrepreneurship. Some of the real differences are between skilled and unskilled labor rather than between labor and management. Unskilled labor varies less in capacity and efficiency than skilled labor. Part of this is due to inherited abilities and part of it to training. The effect of training is probably to increase the spread between the best and poorest in any group. Because of wider differences in capacities and efficiencies among skilled workers, the securing of the right combinations is a matter of much greater importance. Skilled labor is much more specialized than common labor. Many skill-requiring tasks unfit the workers for tasks requiring other skills.

IV. MANAGEMENT

The 1920 Census lists approximately 2,000,000 workers in the United States under classifications that suggest that they are especially hired to manage or supervise. For example, there are 93,000 farm "foremen"; 52,000 mine foremen, superintendents, managers, inspectors, overseers and officials; 202,000 managers and superintendents of manufacturing plants; 85,000 railway officials, superintendents, foremen and overseers, etc. In addition, the 11½ million entrepre-

neurs mentioned in the next section all do more or less managing. This makes a total of over thirteen million who have management as one of their major functions if not their exclusive function.

It is not without significance that so large a part of management is performed by entrepreneurs. In many lines of production, hired management has never proved altogether efficacious. Agriculture seems to be one of these lines. The reason for this in some cases seems to be that management is so important a function that it cannot be successfully performed except by those whose fortune is at stake in the enterprise. One of the most successful types of hired management is that which is combined with entrepreneurship, as in the person of officers of corporations and the like.

The importance of management can hardly be measured in the prices paid for it. A poor manager may undo all the good work of a thousand times his cost in labor, raw materials and equipment. Actually there is much management which makes a negative contribution to production. At the other extreme is management which makes the labor it directs many times as effective as before. Hence the differential between good and bad management is very wide, and combinations of capacities and efficiencies in management and the other elements are very important.

A very small enterprise is managed almost unconsciously. The entrepreneur plans his organization during his leisure hours, and lays out his day's operations at the breakfast table or on his way to work. A larger enterprise may require one man to devote his full time to management. Our largest enterprises require so much management that large staffs of general managers, superintendents and foremen are built up. This makes necessary a careful analysis of organization for operation, the subject of one of the later chapters in this treatise.

V. ENTREPRENEURSHIP

It is difficult to tell from the census whom to classify as entrepreneurs. All owner-operators of farms belong in this category; also all owner-operators of retail and wholesale establishments, banks, transportation agencies, tailor shops, millinery shops, etc. It is equally proper to put physicians, dentists and lawyers in the same group. On this basis, approximately 11½ millions can be classified as entrepreneurs.

It must not be forgotten that all owners of shares of stock are also entrepreneurs to some extent; but most of these belong more properly

in other classifications. Many of them are not even "gainfully employed."

As already explained, it is the entrepreneurs who are responsible for starting all our enterprises and for keeping them going. That it is very easy to make mistakes in starting enterprises, needs no demonstration. The percentage of business failures is surprisingly high. Like people in poor health, some of them keep going one way or another in good times, but the first epidemic sweeps them away. Unfortunately the economic world is badly afflicted with epidemics. One might argue in view of these circumstances in favor of much more caution in starting enterprises. No doubt this would help a great deal in a country like ours, where the entrepreneurs seem to have run altogether too wild. There is scarcely an important industry in the United States which does not have excess capacity as a result of starting too many enterprises. But, on the other hand, one must not lose sight of the fact that the very venturesomeness of our people has been an important factor in our amazing economic progress. What would seem like a proper amount of caution would have kept some of our most successful enterprises from ever being started. This is particularly true of inventions. New inventions sometimes make handsome profits for those who undertake to manufacture the product; but in more cases they prove disappointing failures. Predicting the outcome in advance seems very difficult. Under the foregoing circumstances, the entrepreneur stands in a position of great influence in modern production. As Professor Thorsten Veblen expresses it in his highly suggestive book called "The Theory of Business of Enterprise," the entrepreneur "exercises the discretion." The prosperity not only of communities, but of the whole nation is in his hands to an almost alarming extent.

The rôle of the entrepreneurs in modern production has been increasing in importance since the Industrial Revolution. This is partly because of the increasing complexity of economic organization, which has made it constantly more difficult to keep production and consumption adjusted to each other, and partly because of the rapidity with which economic changes have been taking place. Under such conditions, profits are very uncertain. The best-considered plans often fail; the most carelessly considered often pile up great fortunes. As time goes on, we will come to have a better understanding of our economic organization, keep better records of economic changes, and analyze them more carefully. This will reduce the amount of over-

and under-production. Nor is it likely that economic changes will continue at the present rate. Many of these changes are due to the fact that the world is still very new. In a society more static than ours, such as we are surely coming to eventually, the rôle of the entrepreneur will be less significant.

SUGGESTIONS FOR FURTHER READING

For additional reading upon the human agent in production, see Alfred Marshall's *Principles of Economics* (1920), Book IV, Chapters IV, V, and VI, and Book VI, Chapters IV and V; and F. W. Taussig's *Principles of Economics* (1920), Vol. I, Chapter 2, and Vol. II, Chapters 56 and 57. See also Richard T. Ely's *Outline of Economics* (1919), Chapters XXI, XXII and XXIII.

There is a discussion of wage systems and wage determination in Chapters XXIII and XXIV of *Personnel Administration* (1920), by Ordway Tead and Henry C. Metcalf; also in R. F. Hoxie's *Scientific Management and Labor* (1918), pp. 61–87, and E. D. Jones' *Administration of Industrial Enterprises* (1918), pp. 242–290.

Ordway Tead and Henry C. Metcalf discuss working conditions in their *Personnel Administration* (1920), pp. 67–134. Walter Dill Scott and Robert C. Clothier's *Personnel Management* (1923), treats of employment management particularly in Chapters I to VII, inclusive.

PROBLEMS

1. Fill in the following table, indicating the principal characteristics under each head. (Reconstruct the table leaving more space for answers.)

PRINCIPAL CHARACTERISTICS OF THE THREE GROUPS OF ELEMENTS OF PRODUCTION

	Capital	*Land*	*Human agent*
Supply			
Depreciation			
Specialization			
Perishability			
Mobility			
Variation in capacity and efficiency			

2. Classify the following as *laborers, hired managers, or entrepreneurs,* and give reasons in each case:
   a. Railway president.
   b. Stenographer.
   c. Head bookkeeper.
   d. Head of department in a university.
   e. Operator of a chain store.
   f. Floorwalker in a department store.

3. If human beings could be bought and sold, at what point in their lives would the following sell for the most money? Explain in each case.
   a. A baseball player.
   b. A common laborer.
   c. A great pianist.
   d. A plumber.
4. If each of the foregoing was hiring out for a year, at what point would his annual wage or salary be greatest?
5. Why is society not interested in having each individual obtain all the education and training he can possibly get?
6. Although the individual is a free agent in the legal sense, he actually is very far from being free. Explain.
7. Show how some salaries and even some wages are virtually fixed inputs.
8. It is commonly stated that European immigrants work harder, especially if working for themselves, than do the native-born. Can you account for it?
9. Native labor employed in Mexico, South America, Africa and various places is said to work fewer days and less hours if higher wages are paid than if low wages are paid. Explain.
10. It is a common observation that European business men pay much more attention to details than do American business men. Have you any explanation for this?
11. Why do some small entrepreneurs work 12 hours a day while others work not much more than half this time?
12. What makes dealing with human beings in production more difficult than dealing with land or capital?
13. Show that land, labor and capital can to some extent be used as substitutes for each other in production.
14. List the causes affecting the mobility of human beings as elements of production. Which of these are non-economic in their nature?
15. Which are most mobile, laborers, entrepreneurs or managers? Why?
16. Which class of laborers in your home town is most mobile? Least mobile? Most specialized? Most *free?*
17. In the harvest fields, wages are high due to the short period of employment, while in many canning factories they are low for the same reason. Explain.
18. Why do so many laboring men object to a piece-rate method of payment?
19. Why are so many laborers members of unions?
20. Are you in favor of old age pensions and unemployment insurance? Reasons?
21. How would you calculate the economic loss due to a strike?
22. Will education of laboring classes tend to increase or decrease strikes?
23. Does the government have economic motives in view when it regulates working conditions and hours of labor?
24. Draw a diagram to illustrate your ideas of the productivity of each of the following classes of workers. Let the horizontal scale represent

the ages of the workers and vary it from fifteen years to sixty-five years. Let the vertical scale represent the wages received and vary it from $500 to $10,000.

a. Common laborers.
b. Skilled laborers.
c. Artists (including musicians, actors, writers, painters, sculptors, etc.).
d. Professional workers (lawyers, doctors, dentists, teachers, etc.).
e. Clerical workers (bookkeepers, clerks, etc.).

CHAPTER XVII

POWER

Power is not one of the primary groups into which the elements of production were divided in Chapter XIV. If it belongs in one of these groups at all, it is as an intermediate product used in later production processes, and hence a form of capital goods. But capital goods always represent past effort stored up in some tangible form—and power is usually converted into other forms as fast as it is produced. The exceptions to this are its storage, in water behind dams, in steam in boilers, in springs and suspended weights as in clocks, and in electrical energy in storage batteries. Stored-up energy, or *energy of position*, is called *potential* energy, to distinguish it from *kinetic* energy, or energy of *motion*. The kinetic type of energy is certainly not a capital good. As an element of production, therefore, power must be looked upon as an intermediate product which in most cases passes into other forms as fast as it comes into existence.

The principal sources of power are fuels, such as coal, oil and gas, water power and animals, including the human animal. Probably explosives should also be mentioned as a source of power. Minor sources of power are the winds, the tides, direct solar radiation and electric cells.

I. THE SIGNIFICANCE OF POWER

Production of the physical sort at least always involves the moving of matter. Most of it involves the moving or changing the form or condition of definite physical objects or substances. Moving any physical object requires the application of power to it; likewise changing the form of an object, or the condition of a substance. The simple operation of sewing requires the moving of a needle; carving wood requires moving a knife, chisel and mallet; painting a house requires moving a brush; felling a tree requires moving an axe; sawing lumber requires moving a saw; grinding flour requires moving rolls. Transportation usually requires not only the moving of the objects being transported, but of some sort of a vehicle for holding them. Every step in modern mining represents the application of power in one form

or another, from the exploratory drilling to locate the ore body, to the sinking of the shaft, the drilling of holes into the ore body for blasting, the blasting itself, the transporting of the ore-bearing rock to the shaft and hoisting it to surface, the transporting of it to the mill for crushing and separating, and finally the crushing and separating itself.

It will be noticed that there is a wide range of difference in these various applications of power. Some of them, like sewing, painting, and wood-carving, require no great muscular strength, but a high degree of precision and dexterity. Others, like grinding flour and crushing rock, require the application of great power. Some, like grinding and sawing, use high speed to great advantage. Others, like the separating of cream from milk, absolutely require high speed. A large number of operations require a high degree of uniformity and control in the application of power, which can be attained only with the mechanical types of it.

The evolution of the human race and the history of civilization are closely identified with the development of the forms of power. At first only human power was available; but presently the improvement of tools and weapons made human power immensely more effective. A stone fastened on the end of a stick made a tool that was several times as effective as a stone held in the hand. And the discovery of the bow and arrow enabled the human arm to achieve veritable new wonders in the slaying of game. The domestication of animals was the first step in that drawing upon power from outside sources that has so multiplied the productivity of human power since. One man with a team of oxen even with the crude plows and harrows of early agriculture, could till a much larger area of land than by hand with a spade and hoe. The application of animal power to transportation played a large rôle in the migration of peoples and in the early exchange of goods. The circumstances under which the wheel came into use are not very well understood. No single discovery since has added so much to the possibilities in the use of power. One of the earliest, if not the earliest, use of wheels was on wagons and carts. Wind power was probably first used for propelling boats. The history of navigation up to seventy-five years ago centers largely around improvements in the utilization of wind power in sailing. At the London world conference on power in 1924, Professor Van Iterson called attention to the fact that the important position of the Dutch Republic in world affairs for the several centuries preceding the In-

dustrial Revolution was due to its predominance in the use of wind power, on land for its industries, on sea for its commerce.[1] In the days before the Industrial Revolution and even in the early years of it, water power was of great economic significance. The Industrial Revolution was only partly based upon steam power. The use of machinery was really the fundamental part of it, and much of the early machinery was driven by water power. This is evidenced by the fact that so many of our large industrial centers on the Atlantic Coast obtained their starts as water power cities. Steam power began very soon after its invention to replace wind power both on sea and on land. To-day this is almost an accomplished fact. It did not exactly replace water power, but it pushed it largely into the background for nearly a century. The new industrial developments during that period were largely based upon coal and steam power. Two things have happened in the last fifty years to bring water power into wider use: one of these is the invention of the dynamo, and the other is the transmission of electrical energy. The old water power enterprise which had to be located near falls or rapids on a river so that motion could be transmitted directly to the machines, had many serious limitations. To-day only the power is manufactured at the river, and the industrial enterprise is located wherever is convenient, perhaps as far as 300 miles away.

The later developments in the use of power have greatly increased the magnitude of the power that can be brought to bear. The Census of Manufactures of 1919 lists 6445 plants in the United States providing power from steam turbines with an average of 4955 horse power per plant. The average horse power produced by the 14,008 plants obtaining power from water wheels was only 126; by the 116,183 plants using ordinary steam engines, only 119.[2] The development of electric power has added greatly to the possibilities of control of power. The pressing of a few buttons gives perfect control of an automatic elevator. The moving of a simple lever swings an immense bridge span in and out of place. The application of steam power to transportation in the last hundred years, first in the steamboat, and then later in the railway locomotive, is perhaps of more importance than its use in industry. The greatest use of the gas engine has also been in transportation.

[1] Article by George O. Smith in *Economic Geography*, Vol. I, p. 135.
[2] Abstract of *Census of Manufactures*, 1919, p. 460.

II. THE FORMS OF POWER

Human Power.—The foregoing developments have reduced the amount of physical human energy required in many lines of production to a small fraction of its former amount; but in no case have they eliminated it altogether, or are they likely to do so. Human power has a number of highly important advantages. It is capable of great variability. The force exerted may be anything from the slightest touch of a dentist's finger to the full strength of his hands, arms and body behind a pair of tooth forceps. The pressure can be increased and decreased from moment to moment as needed. The manner of exerting the pressure can be adjusted to each particular situation or object. Each cotton boll has its own condition of maturity and its own position on the plant. The human eye can inspect each of them hastily and the mind can direct the hand quickly and exactly to the proper bolls. A machine would have to take the whole plant and treat all the bolls alike. Agriculture is replete with operations of this kind—the weeding, thinning and hoeing of sugar beets, the picking of fruit, the husking of corn, are further illustrations. The household has its share of such operations—cooking and mending are characteristic examples. Shops, all the way from millinery shops to automobile repair shops, offer abundant examples of the same thing.

There are many operations which can be done either with hand power or machine power, and are done either way according to the degree of advantage of hand power or machine power in each case, according to the supply and wages of labor, and according to the volume of work of this sort to be done. Corn can be picked by machine, but not very well; in consequence it is still done mostly by hand in spite of the high wage-rates prevailing in the corn belt. Dishes can be washed very well by machinery and are so washed in most large restaurants and hotels.

Perhaps of most importance in modern industry are those operations in which mechanical power is applied, sometimes in great force, under the direction and control of the human hand. Most machines must have "operators." The power sewing machine used in all clothing factories is an example of this; likewise the excavating machine, the riveting machine, and the printing press. The operations in which modern forms of power have principally supplanted human power are those requiring great and continuous exertion, like sawing lumber, pumping water, and grinding wheat. In operations of this

kind, one man devoting his energy to the mere tending of a machine, is now doing the work of literally thousands.

Animal Power.—The 1920 census showed a total of 25,270,000 horses, mules and asses on the farms of the United States, and 2,100,000 more in our cities. Russia has a half more horses than the United States. Six other countries combined, including Argentina, Germany, Austria-Hungary and France, have about as many as the United States. Four countries of Southern Europe, Spain, Turkey, Italy and France, have about 5,000,000 mules and asses. Taking the earth as a whole, many more cattle than mules and asses are used for power. Using cattle both for milk and for work is rather common in many parts of Europe and Southern Asia. There are in addition the camel of the desert, the elephant and water buffalo of the tropics, the llama of the Andean highlands and the dog and reindeer of the Arctic regions.

The important historical developments in the use of animal power are the substitution of the horse for the ox in the New World and to a considerable extent in Europe, and recently the substitution of the tractor for the horse on the farms of the United States and Canada, and of automobiles and trucks for horses on the highways. Oxen are better suited than horses to primitive conditions because of their greater strength and ability to forage for their living. But they travel very slowly. As roads and markets developed, horses took the place of the oxen because they combined field work and road travel to better advantage. Also special breeds of heavy horses were developed for field work, and lighter breeds for road travel. Now that the automobile has supplanted the horse for road travel, the light breeds are largely disappearing in the United States. At the same time, the work horses are tending to become heavier and more specialized. An increasing number of mules are being used in the corn belt. Mules are not good road animals, but they are probably superior to horses for field work. In the warmer agricultural regions, mules are used more than horses because they can stand the heat better.

The total number of horses, mules and asses in the United States increased 850,000 between 1910 and 1920. The number in cities alone decreased 1,400,000 between 1910 and 1920. This means that the number on farms alone increased by 2,500,000 during the decade. Previous decades all showed similar increases. Horse-labor has been replacing man-labor increasingly upon American farms. Not only have more machines been used, but larger machines. Gang-plows have

been substituted for single walking plows, two-row cultivators for one-row cultivators, etc. Since 1917, however, the number of horses on farms in the United States has been declining, and promises still further to decline. How far this movement will proceed is problematical. While the tractor is replacing horses on some farms, on others horse-labor will be replacing man-labor. So far as the rest of the world is concerned, there are more regions in which the logical next step is more horse-labor, than in which it is more tractor labor. The Russian government, however, has recently purchased twenty-five thousand tractors for use by its people.

If all the horses, mules and asses in the United States worked every day all the time, the total horse power which they would produce would be a very appreciable amount in comparison with other forms of power. But farm animals probably average less than four hours of work per day in the United States. Tryon and Mann estimate that work animals provide only 3 per cent of the power and heat energy consumed in the United States.[1] For power alone, the figures would be nearer 5 per cent. Even allowing for the fact that this is probably an under estimate, it is not a very imposing showing. This does not belittle the importance of animal power so much as magnify the importance of other forms of power. Finally, it will be well to remember at this point that animals must be fed a maintenance ration even when they are not at work.

Wind Power.—Wind power gave way to steam power on land because it was not dependable, and because it could not be obtained in large enough quantities for the needs of modern industry. Running day and night whenever wind is available, the windmills of Holland, according to Professor Iterson, would do only 60 days of work a year. They are still largely used for pumping water because water can be stored.

Sailing vessels have largely disappeared from the seas because they travel too slowly and have to depend upon uncertain winds. Only 1 per cent of the tonnage of the merchant vessels of Great Britain consists of sailing vessels. Coal has become cheaper even than the wages of seamen.

Power from Fuel.—The fuels used for power are coal, petroleum, wood and alcohol. Tryon and Mann in the article previously cited estimate that 87 per cent of the power *and heat* energy consumed in

[1] F. G. Tryon and L. C. Mann, *Mineral Resources of Future Populations*, in the Journal of the American Statistical Association, December, 1924.

the United States comes from mineral fuels—coal 65 per cent, oil 18 per cent, natural gas 4 per cent. Heat energy represents a considerable part of this total. The industries use large quantities of fuel in the smelting of ores, the manufacturing of steel and other like processes. For stationery power, steam power from coal is by far the prevailing type. Of the power actually used in manufacturing in 1919 in the United States, 17,000,000 horse power, or 57 per cent, was from steam engines and steam turbines, 1,260,000, or 4 per cent, from internal combustion engines, 1,770,000, or 6 per cent, from water-wheels and water motors, and 9,348,000, or 32 per cent, from electric motors. How much of this electric power is hydroelectric (from water power) and how much is carboelectric (from fuel), is not made clear in the data available.[1] Of 24,000,000 horse power used by street railways and lighting combined, 17,200,000 horse power, or 72 per cent, is from fuels.[2] Another very large use of coal for power is by our railroads and steamships. An increasing number of large steamships are now equipped with oil-burning engines, and the electric power being used by a few of our railroads in certain sections is mostly from water power. The internal combustion engine comes into its fullest usefulness in the automobile, the truck and the tractor. If the 20,000,000 motor vehicles registered in the United States in 1925 were in use to capacity even a fourth of the time, they would represent a power production as great as that of all our steam power manufacturing plants. The ratio of use to capacity for the stationery power of the United States in 1919 was about 60 per cent (29,500,000 to 49,000,000); the comparable ratio for motor vehicles is undoubtedly very much lower. Even when an automobile is in use, its power capacity is fully taxed only a small part of the time.

At the time of the invention of the steam engine, steam power had to compete only with water power, wind power, animal power and human power. The principal competitor, water power, was available only in limited quantities and in special locations. As long as only water power was available, manufacturing with machinery was not likely to develop very rapidly, especially with the crude types of water wheels then in use. The steam engine first made manufacturing with steam power possible in any region where coal was close at hand, and very shortly, after the invention of the steam locomotive, in any region

[1] Abstract of *Census of Manufactures*, 1919, p. 460.
[2] Walter Voskuil, *Waterpower Situation in the United States*, Journal of Land and Public Utility Economics, Vol. I, p. 89.

to which coal could be transported economically. Factories could now be built near sources of raw materials, or at convenient breaks in transportation where raw materials and coal could be brought together. Consequently the great industrial development of the last century was based mostly upon the use of coal. More recently, in regions where petroleum and natural gas are available, these have been used for the production of power. Oil produces over 70 per cent of the total energy now being utilized in California.[1]

The tremendous rate of development of steam power in the United States in the last seventy-five years is evidenced by the following data: In 1869 the total horse power used in manufacturing, as reported by the census, was only 1,200,000; in 1899, it was 8,600,000; in 1909, it was 17,000,000; and 1919, it was 27,800,000.[2] The development in England has not been as rapid as in the United States since 1850, but it was much more rapid earlier. Germany developed her power resources most rapidly after 1880. France and Italy have been restricted in power development because of their lack of coal.

This tremendous development raises the whole question as to future supplies of coal. The United States has coal reserves amounting to 23,000 tons, not including lignite, per capita of our present population. Great Britain's reserves represent about 5000 tons per capita; Germany's about 4000 tons; Belgium's perhaps 1500 tons; France's probably 800 tons, and Japan's only 150 tons.[3] The United States is to-day producing about 40 per cent of the world's annual coal supply, and has 51 per cent of the world's coal reserves. North America has 68½ per cent of the world's coal reserves, Asia 17 per cent, Europe 10½ per cent, Oceanica 2½ per cent, and Africa and South America together only 1 per cent.[3] At the present rate of consumption, our coal reserves will outlast those of all other countries. Undoubtedly methods will also be developed for using our vast deposits of lignite. Also more efficient methods of utilizing coal are constantly being developed.

One of these developments in utilization is the conversion of steam power into electrical power. In 1909, only 9.4 per cent of the horse power used in manufacturing in the United States was electrical;

[1] Walter Voskuil, *op. cit.*, p. 101.
[2] Abstract of *Census of Manufactures*, 1919, p. 460.
[3] George O. Smith, Director of The U. S. Geological Survey in an article called "The World of Power" in *Economic Geography*, July, 1925.

in 1919, the comparable figure was 31.2 per cent.[1] The use of electric power permits better adjustment of the power needs to power requirements—each machine can have its own motor of the right size. It also permits power to be produced in large central plants and transmitted in quantities desired to a large number of small users. This results in the pooling of the power needs of many industries whose demands for power come more or less at different periods of the day.

The petroleum resources of the United States are by no means so ample. Mr. George O. Smith uses an estimate made by David White which puts them at 11.7 per cent of the total oil resources of the world. The continent of North America, however, has about a fourth of the world's oil reserve. It is producing four-fifths of the world's output of oil at present.[2]

Water Power.[3]—Of the stationary power capacity available in 1920 in the United States 9,500,000 out of 49,999,999, or 19.4 per cent, was from water power. Of the power actually used in manufacturing in 1919, only 6 per cent was from water power. This indicates that a great deal of the water power capacity of the United States is being used in transportation and lighting. The increase in developed water power capacity from 1900 to 1920 was from 3,300,000 to 9,500,000 horse power. For manufacturing alone, the water power capacity used actually declined during this period. In 1869, almost a half of the power used in manufacturing in the United States was from water power. This was the period when New England did most of our manufacturing. By 1899, the percentage had declined to 14.2, and by 1919, as above stated, to 6 per cent.

The potential water power of the United States is estimated at 27,943,000 horse power at minimum waterflow. Maximum waterflow can be utilized fully in most cases only if some economical means can be found for storing energy, or of pooling water power and coal resources to better advantage than at present. Taking the minimum figure, only 36 per cent is developed at the present time; taking the maximum figure, only 16 per cent. Under the Waterpower Act of 1920, providing among other things for registration of water powers, applications were filed up to June 30, 1923, for rights to develop an estimated installed capacity of 21,500,000 horse power. Since most

[1] Abstract of *Census of Manufactures*, 1919, p. 470.
[2] *Op. cit.*, pp. 139–140.
[3] Walter Voskuil, *op. cit.*

of these applications were made the first year under the Act, it would appear that this represents about all the water power capacity that can be economically developed at present. Unfortunately, most of our undeveloped water power is in the Pacific and Rocky Mountain States. Of the applications filed, nearly three-fourths were for developments in this region.

Mr. Voskuil points out three limitations upon the use of water power, as follows:

(1) It can be used only for stationary power, and in some regions stationary power needs are not equal to potential water power production. In the Mountain States at present, only 4.2 per cent of the maximum potential water power is realized; and in the Pacific States only 2.6 per cent. There are many water powers not now developed that could not find a market for their power. The power that would be developed in connection with the proposed Great Lakes waterway would probably go without a market for a while.

(2) It can be transmitted economically only limited distances. The power loss in transmission ranges from 10 to 20 per cent. The construction and maintenance costs of transmission lines are large items of expense.

(3) Under many circumstances, steam power from coal competes successfully with water power. Under the most favorable conditions at Niagara Falls, the cost of current from water power is approximately 2 mills per kilowatt-hour. Modern steam plants produce current at from 5 to 6 mills per kilowatt-hour. A comparative study in Maine reported by Mr. Voskuil gave hydroelectric costs varying from 5 to 9 mills per killowatt-hour, and steam costs ranging from 10 to 12 mills per kilowatt-hour. Where coal is near at hand, and electric current from water power plants must be transmitted for some distance, steam power may easily be the more economical. The costs of some hydroelectric installations are so high as to more than offset the cost of coal.

North America has 47 per cent of the developed water power of the world and Europe 43 per cent, which leaves only 10 per cent for the rest of the world, and 7 of these 10 per cent are in Asia. Of the world's potential water power, however, North America has only 14 per cent, and Europe only 13 per cent. Africa, with its high central plateau and equatorial rains, is estimated to have a potential water power development of 190,000,000, which is 42 per cent of the world total. This will partly offset her lack of coal. South America, likewise short

of coal, has 12 per cent of the world's potential water power. Asia has 15 per cent of it, and Oceanica 4 per cent.[1]

Although up to 1920 the United States led the world in rate of water power development, since 1923 Europe has been leading. The world increase from 1920 to 1923 was 26 per cent.[1] It would appear that Europe at least is in the midst of an era of water power progress. France has recently harnessed the Rhine and is transmitting power 250 miles to Paris. Switzerland is electrifying her railroads. Electric power from Sweden's water powers is being transmitted to Denmark. It has been estimated that ninety per cent of the farms of Germany have electricity, and much of this is provided from water power.

III. THE FUTURE OF POWER

There is no question concerning which speculation is more fascinating than that of the future sources of power. Our petroleum supplies will not last more than a century or two at the present rate of use. There are, however, vast deposits of oil shales in the United States and Canada from which petroleum can be extracted at a cost somewhat above present price of oil. The modern automobile and aëroplane require liquid fuel. Where will it come from when the petroleum is gone? The proposal is to use alcohol made from potatoes and other starchy vegetables. But if land has to be used to produce alcohol, then less will be available to grow food.

The coal deposits of the United States would probably last two thousand years at present rate of use, but the rate of use is rapidly increasing. Europe's supply will be exhausted much sooner. After that will come the lignite and the peat, both good fuels, but rather expensive to reduce to form for burning. The water must be evaporated from the peat, which itself either requires artificial heat, or a long slow impractical sun-drying process.

After the oil and the coal are gone, we will still have our winds and our water powers. Although the maximum water power given above for the United States is only 53,905,000 horse power, much more could be produced if highly necessary. Reservoirs could be built for storing water. Streams could be more completely harnessed. Little streams could be used as well as large ones. Under extreme conditions, it has been estimated that perhaps 200,000,000 horse power might be produced from water power in the United States.[2]

[1] *Op. cit.*, George O. Smith.
[2] Whitbeck and Finch, *Economic Geography*, p. 177.

As a last resort, power could be obtained by harnessing the tides, and by direct solar radiation. Both have been accomplished experimentally. The cost of the latter would surely be very high unless new discoveries are made in connection with it.

Finally, few scientists are satisfied that the last achievement has been made in producing power from the chemical action of matter. New explosives are being discovered every few years. A gas engine obtains its power from a succession of controlled explosions. Why not some new type of explosive that can be brought under control like gasoline? The physical chemists are even expecting some important power developments to come from our growing understanding of the constitution of matter itself.

In the meantime, the most important attack on the problem is that of conserving our present power resources. This means less wasteful mining, more efficient power machines, and better power distribution. The significant development of this latter sort is the proposal to hitch together the power plants of the whole Atlantic Coast into three or four large units. This would mean a pooling of the power output of all the water power and steam plants in this area. The water powers could produce power to their full capacity all the time, and the steam plants could supply the balance. As many plants could be operated at one time as are needed to supply the power at the time. Many of the demands for power—for example, for industries, for lighting, for trolleys—come at different times of the day, or have their peak-loads at different times. One of the present drawbacks of water power is that steam units need to be kept in reserve in case the water supply fails. Joined to a circuit of the sort proposed, no plant would need to maintain a reserve power unit. The engineers already have their plans for these large units pretty well drawn. The governors of several states are pushing the movement. Popularly, the terms "giant power" and "super-power" are being applied to these projects. These terms are misleading. It is not proposed to develop any new type of power, but merely to secure a better distribution of power resources now available.

The race between nations for leadership in the next few hundred years will largely be determined on the basis of the supply and utilization of power. That statesmen realize this is evidenced by the vigor with which they have recently contested for supplies of petroleum and coal.

SUGGESTIONS FOR FURTHER READING

The principal sources used by the author in preparing this chapter were the following, and the reader is directed to them for more detailed information:

U. S. Census: Manufactures (1919), Vol. IX, also Abstract of same, Vol. X.
World Atlas of Commercial Geography (1921), U. S. Geological Survey. Part II, *Waterpower of the World.*
R. H. Whitbeck and V. C. Finch, *Economic Geography* (1924), Ch. XII.
J. Russel Smith, *Industrial and Commercial Geography* (1926), Ch. X.
T. N. Carver, *Principles of Political Economy* (1919), Ch. XI.
George O. Smith, *A World of Power, in Economic Geography,* Vol. I, pp. 133–142.
Walter Voskuil, *Waterpower Situation in the United States in Journal of Land and Public Utility Economics,* Vol. I, pp. 89–101.

PROBLEMS

1. Do you believe that the development of power in all its forces has decreased the arduousness of labor, or has it merely made labor more productive?
2. Has the development of power taken the direction more of doing things which were already being done by human power, or of doing things which had never been done before?
3. Do you think the men who developed the first sources of outside power (animals, wind, etc.) were motivated more by the desire to accomplish new tasks or by the desire to make old tasks easier? Is this still true?
4. What are the characteristics of tasks which lend themselves readily to power execution? Give some examples of such tasks.
5. What industries are apparently limited in the extent to which they can apply power to the performance of their tasks.
6. Will wind power ever come into extensive use again?

PART FOUR

THE OPERATING UNIT

CHAPTER XVIII

THE BUSINESS UNIT

The combination of enterprises and production elements discussed in Parts II and III does not really give us production. One thing more is needed—the *entrepreneur*. The form which production finally takes when it appears in real life in full association with the entrepreneur is the *business unit*. To make a business unit, there must be plant, equipment, labor, raw materials and supplies on the one hand; but there must be also the entrepreneur to select them, buy them and assemble them, to set them in operation and keep them in operation, and finally sell the product. This section of the book will be given over to a discussion of the functioning of the entrepreneur in production. The actual work of the entrepreneur is mostly managing; here the term management will be used more frequently than entrepreneurship.

Although an entrepreneur is needed before there can be a business unit, the two must be thought of as distinct entities. It helps us to understand this to look at a business unit from the point of view of an accountant, who always reduces his analysis of any business enterprise to the form of a *balance sheet* statement, such as the following:

Assets		*Liabilities*	
Land and buildings	$190,000	Original capital invested	$150,000
Machinery and equipment	40,000	Later investments	20,000
Raw materials, goods in process and finished products on hand	20,000	Net earnings reinvested	50,000
Accounts receivable	15,000	Accounts payable	40,000
Cash on hand and in banks	25,000	Undistributed profits	30,000
Total assets	$290,000	Total liabilities	$290,000

On the *asset* side of the balance sheet is listed the various properties of the business and the amounts due it from creditors; on the *liabilities* side, the amounts which the business has received from its owners one time or another, either when it first started, or a little later when more capital was needed for new equipment, or again when some of the net earnings of the business were left in the business in place of being paid out to the owners to whom they belong; also the amounts

now due the owners in the form of undistributed profits; also accounts due to persons other than the owners, "accounts payable." This sort of an analysis *sets up the business unit as separate from its entrepreneurs*, and shows the relationship between the two.

Obviously there can be no real *business* without some form of *buying* and *selling*. If it is a merchandising business, the stock of goods must be bought before it can be sold. Labor and buildings must be bought. A manufacturing plant must buy its raw materials. And this buying and selling is a very important part of business. But it is a mistake to go as far as some people do and say that it is all there is to business. The organizing and planning and supervising are surely of equal importance with buying and selling. If there is only one idea which is essential to business, that one idea must be entrepreneurship.

I. THE THREE PRINCIPAL TYPES OF BUSINESS UNITS COMPARED

Business units are mostly of three types when classified on the basis of entrepreneurship. These are the individual or *one-man unit*, the *partnership*, and the *corporation*. In the one-man unit, one person owns the business, puts in all of the capital, either out of his own resources or by borrowing it, assumes all the chance of gain or loss, and if it is a small unit, does all the organizing and supervising and buying and selling. If the individual is rich or commands large resources, the business may be a large one and still be a one-man unit. In that case, the owner is not able to look after all the details of organization and management himself and so hires a staff of assistant managers. Size, therefore, is not the distinguishing characteristic of the one-man unit.

The partnership business is like the foregoing except that it is owned by two or more persons, all of whom have a voice in its management, share in the chance of gain or loss, and ordinarily participate in the actual work of organization and management. The partners may invest equal or unequal amounts in the business, and have ownership of it in proportion. In partnerships where all do not invest equally or assist equally in the management, it is customary to pay the different partners salaries in proportions to the management they contribute. Occasionally one of the group of owners is a "silent partner," that is, he contributes funds to the enterprise, but gives little or no attention to the details of its administration.

A corporation distributes ownership and assumption of chances of gain or loss over a still larger group, namely, the *shareholders* or *stockholders*. The capital required to start the business is divided into a large number

of equal shares, and these are sold to investors in whatever number desired. These shares are called the "stock" of the corporation. The most usual size or "par value" of a share of stock is $100, but it may be as low as a dollar or even ten cents. Shares at $50 and $10 are not uncommon. The par value of a share of stock, at the time when the stock is first issued, is supposed, in the eyes of the law, to represent the actual value of a given share of the enterprise. If the business does not prosper, however, the stock may later sell on the market for less than par, or if it prospers, for more than par. The total par value of all the stock, plus the funded debt, is referred to as the "capitalization" of the corporation. Thus a business with 2500 shares of stock with a par value of $100 each, and no bonds or other funded debt, would be capitalized at $250,000. An increasing number of corporations these days are issuing "no par" stock. A share of such stock represents a fractional part of the assets of the business, the same as does a share of par stock. The only difference is that a nominal value has not been named for it at the time of issuance. These 2500 shares of stock may be owned by a few people or by several hundred. State laws governing corporations almost always specify the least number of persons who can start a new corporation. The assumption is that there will be a considerable number. These are all joint owners, and except under special arrangements, entitled to some voice in the management of the enterprise. Obviously if all are really to have such a voice in management, and if a business encumbered with so many owners is really to function, some machinery of government must be created. This machinery is a board of directors and set of executive officers duly elected by the stockholders, and assigned certain powers and duties in a set of by-laws agreed upon or agreed to by the stockholders. In actual practice, most matters of management are decided by the executives and directors, only a few of the major issues being settled by the body of stockholders at annual or special meetings. This will be discussed in detail in a later chapter. The usual manner of voting is one vote for each share of stock. The executive officers receive regular salaries or are paid for the time which they devote to the business.

Legal Liability.—There are a number of other differences between these three types of entrepreneurial units which must be recognized. First of these is the matter of legal liability. The owner of a one-man business enterprise is liable to the creditors of his enterprise to the full extent of his worldly wealth, except for a few articles

of property which are exempt by state law.[1] If his enterprise fails the creditors may lay claim to any other property he possesses until all are paid in full. The liability is the same in a partnership as in a one-man unit, with the additional necessary circumstance that all are responsible for each. Each member of the partnership is bound by all the acts of the others relating to the business in which they are jointly engaged. If one of the partners makes a decision which turns out disastrously, even though he made it without the approval of the others, the others must join with him in making good the claims of creditors, not only to the extent of the amount which they have put into the business, but also with any other property which they may have.

In the ordinary corporation, in contrast to the foregoing, the shareholders who are the owners of the business, are liable only to the extent of the par value of the stock; that is, they can lose only the money which they have invested in purchasing the shares of stock. The creditors must look to the assets and liabilities of the corporation itself for the security for their claims. John Smith, one of the stockholders, may be very wealthy, but his property outside of this particular corporation cannot be touched to meet claims against the corporation. Exception to the foregoing is made in most states in the case of banking enterprises, and in a few states, notably Minnesota and California, for merchandising and certain other types of enterprises. They have what is called "double liability," that is, the stockholder is liable for twice the par value of the stock, for what he invested when he purchased his stock, and the par value of the stock in addition.

It will be apparent that the legal status of a corporation is exactly in keeping with the accountant's analysis of a business unit. The law looks upon a corporate business as entirely separate from the individuals who compose it. It has a legal existence separate from theirs. It is sometimes referred to as an "artificial person"—*artificial*, because it is wholly a creature of the law; a *person*, because in some respects it acts and does things which only an individual can do, such as buy land, borrow money, etc. The law does not recognize the partnership and one-man business unit as having existence distinct from the owners of them. In this case, the accounting and the legal analysis do not agree.

Transfer of Ownership.—The owner of a one-man enterprise is free to sell it whenever and to whomever he pleases. This is not true of the separate owners in a partnership. No one of them can sell

[1] Personal property. A limited amount of personal property, forty acres of land in some states, etc.

his share of the business without the consent of the others. If the others will not agree, then the only procedure is to sell out the whole business and divide the proceeds of the sale. Disagreements are very common in partnerships, and hence sale and dissolution to arrange settlement is a common occurrence. Such a procedure is almost unavoidable if one of the partners dies without having previously made a disposition of his share which is acceptable to the other partners.

In a corporation, on the other hand, a shareholder is ordinarily free to sell his shares at any time. Some are always losing interest in the business or needing the money for other purposes, and hence wanting to sell out. Others are glad to take their places. When a shareholder dies, his shares of stock are passed on to his heirs. So general is the buying and selling of the shares of stock of most large corporations that there is a regular market for them, and prices are quoted every day in the financial journals. Thus the body of stockholders is constantly changing, just as the particles of water in a river are constantly changing; but the corporation continues, holding its shape and course just as does the river. There is nothing, therefore, to keep a corporation from lasting indefinitely if it prospers with its business affairs, and except as laws may limit the period of its existence. It used to be the practice to grant charters to corporations in perpetuity, but the United States Supreme Court ruled in the Dartmouth College Case in 1819 that a corporation charter once granted in a certain way could not be changed by subsequent legislation except with the consent of the corporation; and since then it has been common to limit the life of a corporation to fifty or a hundred years, or less in the case of banks. But all that the corporation needs to do in order to continue longer is to take out a new charter, making such changes from the old one as may be necessary because of new laws passed in the meantime.

Distribution of Earnings.—The owner of a one-man unit has a choice between reinvesting his profits in the same business, investing them in some other enterprise, or spending them in consumption goods. Ordinarily his business needs all the money he can spare from consumption needs to take care of its expansion. The same alternatives confront the members of a partnership. The only additional question is the distribution of earnings between the partners. In the case of small enterprises, usually all contribute the same capital, and it is common to assume that all the partners contribute the same value of services, and hence the partnership earnings are divided equally. If, however, the partners contribute unequally either of capital or of

services, the usual arrangement is to pay each a salary according to the value of his services, and distribute the remainder in proportion to the amount of capital contributed. If the business is prosperous, higher salaries will be allotted to the partners, which has the effect of keeping down the returns upon capital.

The net earnings of a corporation are either distributed as *dividends* on stock or reinvested in the business. All officers of the corporation are paid salaries. The distribution of dividends depends upon the kinds of stocks which the corporation has issued. First is the difference between *preferred* and *common* stock. Preferred stock has a definitely specified rate of dividend, which is not guaranteed, but which is always paid first if there are any earnings to distribute. The rate specified is ordinarily 6, 7 or 8 per cent. Common stock receives a dividend only if there are earnings left after paying the dividends on the preferred stock. If the enterprise is prospering, the dividend rates may be much higher on common than on preferred stock. There are two kinds of preferred stock, *cumulative* and *non-cumulative.* In the former, deficits in dividends one year are carried over and paid in succeeding years. Thus if a company fails to pay the full specified dividends on cumulative preferred stock in 1926, any earnings in 1927 or later in excess of enough to pay current preferred stock dividends will go to make up the back payments on preferred stock before being used as common stock dividends.

Obviously if corporate earnings are reinvested in the business, each share of stock is worth more than before. Property of the stockholders has been retained as additional capital. In consequence, the market value of the shares of stock should rise; and it generally does. The earnings of each class of stock should at the same time increase because more earning power has been provided. In this way, some shares of stock have come to represent several times their original value. Shares of stock will be found quoted in the financial journals sometimes as high as a thousand dollars, and several hundred dollars is not uncommon. A more usual procedure, however, is for the company to increase the capitalization and give each stockholder two shares for one. This amounts to paying a dividend in the form of shares of stock—a "stock dividend." One reason for increasing the capitalization by issuing stock dividends is that this apparently keeps the dividends at a normal rate, makes the industry less attractive to potential competitors, and saves it from a considerable amount of criticism from the public, which is likely to take high dividends as evidence of

monopoly practice or "profiteering." This is especially important in the case of public utility corporations like railroads, streetcar companies, and gas and light companies, whose charges and service are subject to public regulation.

One way of reinvesting corporate earnings in the business is to use them to pay off debts, retire bonds, and even retire preferred stock. Retiring bonds makes the stock of the corporation more valuable, and furnishes a basis for stock dividends, the same as reinvesting earnings in expansion or additional equipment. Retiring preferred stock makes the common stock more valuable.

Borrowing.—The single owner of a business must borrow on notes on the basis of his own personal security, or on mortgages against the physical assets of his business. If the enterprise is a large one, the mortgage may be reduced to the form of bonds, that is, divided into small units, usually either $100, $500 or $1000. These represent the first claims on the assets of the business. Interest on such bonds must be paid, likewise payments on their principal, or the business will go into the hands of the receiver, which means in many cases that it will be sold to redeem the bonds. These bonds, like any other mortgage, carry a definite rate of interest and usually have a definite date of maturity. Partnerships borrow money in these same ways. Corporations make free use of bonds. In borrowing for short-time periods on notes, they have the unmortgaged assets of the corporation to use as security. The stockholders' other assets are not available as security, although the officers of a corporation sometimes pledge their own personal assets as security as a last resort. The security for corporation bonds is most frequently the assets of the corporation, but sometimes it is *collateral*, that is, stocks or bonds or property of other corporations owned by the corporation issuing the bonds.

A corporation thus has a choice between raising its capital all by sale of stocks and raising some of it by sale of bonds. The bonds are ordinarily the easier to sell, being a safer and surer investment, even though the interest rate which they carry is likely to be less than the dividend rate on the stocks. On the other hand, the interest on them must be paid when due, whereas the dividend on stocks, even on cumulative preferred stock, can be passed for the time being. Some bonds carry only a relatively low rate of interest. A company which is paying high dividends will naturally prefer to finance its expansions by bond issue rather than by sale of stock. In this way it can borrow money for perhaps 6 per cent which may yield twice that when

used in the business. This means generally increased profits for the present stockholders. If a period of depression hits the industry, however, the situation is most decidedly reversed. The interest on the bonds must be paid somehow or other. It is probably unwise for any enterprise to have over half of its liabilities in the form of bonds. This is particularly true for companies just starting, whose earnings are likely to be small for the first few years.

II. RELATIVE PREVALENCE OF THE THREE TYPES OF BUSINESS UNITS

Statistics on types of business units engaged in manufacturing in the United States have been collected at five-year intervals since 1904. Table XXI following compares the statistics for the years 1904 and 1919 (those for 1924 being not yet available). Although only 31.5 per cent of the establishments in 1919 were corporations, these employed 86.6 per cent of the wage earners, and turned out 87.7 per cent of the product. The 138,000 one-man units employed an average of only 4.5 men per plant; the corporations an average of 86.1 men per plant. The "all others" group, consisting mostly of partnerships and coöperative associations, employed an average of 9.2 men per plant. The table also shows that corporations are growing more rapidly than the other types of ownership.

TABLE XXI. TYPES OF BUSINESS UNITS IN MANUFACTURING FOR 1904 AND 1919.

	1904		*1919*	
	Number	*Per Cent*	*Number*	*Per Cent*
Establishments				
One-man units	113,946	52.7	138,112	47.6
Corporations	51,097	23.6	91,517	31.5
All others	51,137	23.7	60,476	20.8
Total	216,180	100.0	290,105	100.0
Wage Earners (Thousands)				
One-man units	756	13.8	623	6.9
Corporations	3,863	70.6	7,875	86.6
All others	850	15.5	598	6.6
Total	5,468	100.0	9,096	100.0
Value of Products (Millions)				
One-man units	$1,703	11.5	$3,536	5.7
Corporations	10,904	73.7	54,745	87.7
All others	2,187	14.8	4,137	6.6
Total	14,794	100.0	62,418	100.0

Even in absolute numbers, nearly twice as many new corporations as one-man units were added between 1904 and 1919, and the percentage increase was nearly four times as great. In value of products the corporations advanced during this period from 73.7 per cent to 87.7 per cent of the total. The increase in the "all others" group was mostly in coöperative associations. The partnership is becoming relatively less prevalent in the manufacturing field.

Corporations are even more prevalent in mining than in manufacturing. In 1919, over 51 per cent of the producing mines were corporations, and these employed 94 per cent of the wage earners and produced 94 per cent of the product. Over 20 per cent of the establishments were one-man units and 25 per cent were reported as "firms" or partnerships.

In transportation, especially railway transportation, corporations have even more complete possession of the field than in manufacturing and mining. Banking is also to-day largely organized upon a corporation basis. The fields which are mostly organized on a one-man basis are agriculture, retail merchandising and professional service. There are very few farming corporations, and for that matter, relatively few farming partnerships. The field in which most partnerships are found are professional service, retailing, and small shopkeeping.

Combining all fields of production in the United States, probably somewhere between 50 and 55 per cent of the national income as classified in Table II is earned in corporate enterprises, another 5 per cent in government enterprises, which leaves only about two-fifths for one-man units and partnerships.[1]

III. SPECIAL ADVANTAGES OF EACH TYPE

Before taking up the reasons for the present distribution of types of ownership, one will need to consider in more detail the characteristics and special fitnesses of each of the types.

The One-Man Unit.—The outstanding characteristic of the one-man unit is that the managing is done by the man who owns the business and who has staked his personal fortune upon the success or failure of it. All the efforts of all the years to improve the form of business organization have produced nothing that takes the place of this satisfactorily. It means that there is one person who is vitally

[1] W. F. King estimated that 39 per cent of the total product of all enterprises was produced by corporations in 1899, and 44 per cent in 1909. See his *Wealth and Income of the People of the United States*, pp. 208–211.

interested in each detail and will do his best to keep it in mind. Since one person has all the various details in mind, he sees them at all times in relation to each other, which insures unity and coherence in the management of his enterprise. Any other form of organization means either hired management, as in the case of the corporation, or division of supervision of details, as in the case of a partnership. Or if responsibility for details is not divided in a partnership, then there is a duplication of responsibility for them. Hired management is sometimes very successful. Not infrequently does it happen that a hired manager steps in and salvages an enterprise that an incompetent or shiftless owner-operator has nearly wrecked. But these are rather exceptions to general experience. However well-intentioned a hired manager may be, he is not the one who has to meet the pay roll on Saturday night. He therefore is not in a position to weigh entrepreneurial alternatives in their true significances. The conclusion from this is that whenever one man is adequate to manage an enterprise, that one man should be the owner of it. If the business is a little larger than one man can encompass, then the advantages of single owner management must be weighed against the losses from inadequate supervision and a balance struck in favor of one or the other.

The other outstanding feature of the one-man enterprise is the ease with which it is started and stopped. So easy is it to start such an enterprise that sometimes we do not realize when we have done it. When the author began writing this book, he started a one-man enterprise. The young lawyer who hangs out his shingle is starting a one-man business. Some states require many kinds of business enterprises—retail stores and shops, for example—to take out licenses. More require a few special types of enterprises, such as hucksters, house-to-house salesmen, soft drink stands and the like to take out licenses. But securing such a license is ordinarily a mere formality. The closing out of such an enterprise is even simpler. It can be sold in less then five minutes so far as any business or legal formalities are concerned.

The limitations of the one-man enterprise should now be readily apparent. A business does not have to grow very much before it develops more details than one man can keep sufficiently in mind or coördinate properly. If he is to have any assistance with the management, it must be hired; and either a partnership or a corporation provides better management assistance than can be obtained by the

out-and-out hiring of it. It is also likely to need more knowledge and judgment than one man is likely to have. Hired assistant managers are not the best sources of such additional experience and wisdom. A growing business is likely soon to need more capital than one man can provide.

But we must not forget that there have been a good many rather large one-man businesses in the world at one time or another. In the early days in the United States, they were rather common. Our great "captains of industry" usually built up their enterprises on the one-man basis. Their businesses were so prosperous that they furnished all the additional capital needed for expansion; or else expansion was made to wait till the capital was earned. Such men had great capacity for details, great force of character, and an ability to select capable assistants and inspire them with a common purpose. But with the passing of the great founders of such enterprises, most of them have taken the corporate form. Either a stage was reached where one man could no longer be sufficiently versatile to do justice to all phases of it, or none of the sons was an equal of his father.

The business which lends itself to one-man ownership is therefore likely to be small, or have few details to supervise in proportion to size. Not only is one-man ownership adequate for such businesses—it is much better suited to them than any other kind of ownership. In the chapter on "The Size of the Business Unit" will be pointed out a number of important reasons why enterprises tend to remain small in certain fields, particularly farming, storekeeping and shopkeeping. Since one-man ownership is better than any other kind of ownership for most small businesses, it will tend to prevail in these fields. The very possibility of realizing the great advantage of having the owner do all the managing is one of the important reasons that enterprises remain small in these fields. This is especially the case with enterprises with a great variety and quantity of detail in proportion to their size—like farming enterprises, especially diversified farming enterprises. Storekeeping and shopkeeping fall in the same class because success in them depends upon ability to satisfy highly personal and individual human wants. Thus the size of business and one-man ownership are interacting influences. Various influences give us a large supply of small enterprises such that one owner can manage; and the advantage of such ownership helps keep them small.

The census of 1919 shows six manufacturing industries out of 343 in which one-man units turned out a greater value of product than did

the corporations. These are as follows: rag carpets, cheese, hand-decorated china, feathers and plumes, hair work, and sausage not made in meat-packing plants. It shows 13 more whose value of product was more than half that of the corporation. These are as follows: artificial flowers, artificial stone products, automobile repairing, cigar boxes, bread and other bakery products, brooms, women's clothing, electroplating, engraving, fur goods, japanning, marble and stone work, turpentine and rosin. It shows 76 more, however, in which the number of one-man units exceeds the number of corporations. Let us point out a few of the outstanding of these: bookbinding, boot and shoe cut stock and findings, brushes, buttons, carriages and wagons, men's clothing, hats and caps, jewelry, lumber and timber products, millinery, printing and publishing, saddlery and harness, and tobacco and products thereof. The first list includes industries that are still in the household stage, or not very far removed from it. Even the country cheese factory is only one step removed from the individual farm household. The second list includes mostly work that for various reasons is still done in considerable part in small shops. In the third list are included industries in which the field is divided between the small shop and the big factory, the latter predominating and no doubt increasing its predominance. In some of the groups, the distribution between the small shops and the large factories is very marked. For instance in the manufacture of tobacco, cigars and cigarettes, only 8 per cent of the establishments are corporations, but these 8 per cent employ 70 per cent of the workers, and manufacture 83 per cent of the product. The corporations employ an average of 121 workers, the others an average of only 5 workers.

The Partnership.—The partnership carries over from the one-man unit the important connection between ownership and management, with, however, a slight weakening of it. No one of the partners is staking his personal fortune alone upon the effect of his acts. As already suggested, in a partnership it is either necessary for each partner to be informed fully as to all details of the business, which entails spending a good deal of time in conferences between the partners, and also a good bit of duplication of effort; or else for responsibility to be divided between the partners, which is likely to destroy some of the unity and coherence of the program. The problem also now enters of the placing of responsibility for acts. Even if the partners agree upon a course of action, it is likely to be looked upon as sponsored especially by one of them, and this gives cause for argument.

Then there are always questions as to who is responsible for certain details of the business.

It is not so easy to start a partnership as a one-man unit. First of all, the partners must be found, and it is highly important that the right men find each other. Partnerships are constantly being closed out because the partners are unable to work together. Choosing a business partner is almost as serious a matter as choosing a wife. Secondly, an agreement must be worked out as to the amount of capital invested by each partner, the division of duties and responsibilities, the plan of conducting the business, and the division of earnings. This agreement should be reduced to definite written form. As already pointed out, it is more difficult to close out a partnership than a one-man unit. Take a retail store as an example: ordinarily all the outstanding accounts against customers will have to be collected before a settlement can be made.

The partnership management does, however, generally make it possible to assemble more capital than with a one-man unit; also a greater amount and variety of knowledge of the business and experience. The combined judgment of several is nearly always better than the judgment of any one of them. The partners furnish the additional management needed to look after a growing volume of details without having to resort to hired management. In a partnership a certain amount of specialization can also be introduced. One of the partners may be a good business executive, another a good technician, another a good office man. A type of specialization not uncommon is for one man with capital and limited experience to join forces with another with limited capital and much experience. Lastly, as compared with a corporation, it is much easier for partners to change policies, or change the terms of an agreement between them, than it is for a corporation to make similar changes. All that the partners need to do is to get together and agree upon it. No one else needs to approve it; no one even needs to be notified of it, although it is always well to have a written record of it.

It will be easy to forecast from this discussion the type of enterprises which will have partners as owners. They will be small, but ordinarily not so small as the one-man units. They will also be enterprises in which the amount of supervision is large in proportion to the size. Perhaps in practical operation, the most important consideration is that the enterprise be one in which the management can be clearly divided between the partners, and that there be not too

great interdependence between the departments of the business. The best proof of this latter is the prevalence of partnerships among physicians, lawyers, accountants, and consulting engineers. In such partnerships, the men may consult with each other, but in all essential particulars they are independent acting units. Retailing lends itself fairly well to partnerships because the business is small, relatively simple, and ordinarily all conducted in one room so that it is easy for each partner to know all that is going on. There are also fairly well recognized schemes of division of functions in a retail establishment —for example, as between the buying, the selling and the record keeping.

The census statistics, for reasons already explained, do not give a clear picture of the distribution of partnerships in manufacturing. Except in certain lines, such as butter making and cheese making, the "all others" are mostly partnerships. Of these 343 industries, there is but one which has more "all others" than either one-man units or corporations—this is women's clothing. There are 25 which have more "all others" than corporations, but most of these also have more one-man units than corporations. Following are the industries in which there is probably a really significant proportion of partnerships: automobile bodies and parts, automobile repairing, bookbinding, boots and shoes, bread and other bakery products, carriages and wagons, men's and women's clothing, confectionery and ice cream, electroplating, flour mill and grist mill products, furniture, gloves and mittens, hats and caps, jewelry, lumber and timber products, marble and stone work, millinery and laces, mineral and soda waters, pocketbooks, printing and newspaper publishing, toys and games, trunks and valises, umbrellas and canes. These, as is apparent, are industries in which for various reasons, principally limited market area or local supply of raw materials, and simplicity in the product, plants are likely to remain small, and yet may easily require more capital for plant and equipment than one man can provide. A good many of them are merely expanded shops.

An interesting use of the partnership form of organization is in connection with many large investment banks and other financial organizations, for the most part operating in the securities market. No doubt many of these started as small enterprises with capital contributed by two or three individuals, and have grown to their present size as the result of great prosperity. They retain the partnership form partly because this gives to the management a much freer

hand in making decisions, and partly because the firm name has acquired a reputation in the business world.

The Corporation.—A few additional facts as to corporate organization must be explained before we can discuss its adaptabilities intelligently. First of all is the matter of management and control. Ordinarily each share of stock carries one vote. The stockholders vote at the annual meetings called to elect members of the board of directors and other officers, and at annual and special meetings upon questions of general policy. In actual practice, much of the voting is done by proxy; that is, the stockholders, not being able or not caring to attend the meetings, designate some one else to do their voting for them. The stockholders usually receive along with the written notice of meeting a blank form upon which to sign over their voting rights to a proxy. Since they do not ordinarily know the other stockholders in the corporation, or who is expecting to attend the meeting, they are likely to designate as proxy whomever the management suggests. In this way a strongly interested group may keep control of the corporation management, even though owning a small percentage of the stock. In many large corporations with stock ownership widely scattered, as little as 10 or 15 per cent of the stock gives effective control, except on occasions when a struggle for supremacy develops between rival factions of the organization. It is not unusual in large organizations, however, and it is the usual arrangement in small ones, for one stockholder or a coöperating group of them to own over half of the stock, and thus retain as complete control as if they owned all of it.

The preferred and common stockholders frequently have equal voting rights—one vote for each share owned. But since the common stock is usually in excess of the preferred stock, the common stockholders can win out whenever an issue rises between them. On many occasions their interests are not likely to be the same. The common stockholders are likely to want dividends on common stock paid every year if it is in any way possible, whereas the preferred stockholders will want to see instead the plant and equipment kept in the best possible condition, and even expanded, so as to increase the security of their investment. Because of the danger of such conflict of opinion, preferred stockholders are denied voting rights in most of the newer incorporations. This puts them in the same class as the bondholders so far as voting rights are concerned, and really with less control over the corporation, because they do not have the

power to force a receivership that bondholders have if interest is not paid.

Even when a corporation is handled in such a way as to preserve the rights of stockholders, there is a high degree of concentration of executive power in a few hands. The manner in which this is arranged will be developed more fully in the following chapter. Suffice to say at this point that the stockholders delegate part of their authority to the board of directors, and the board of directors part of theirs to the executive committee of the board and the president.

Let us now enumerate and briefly explain the commonly recognized advantages of the corporation. Some of them have already been mentioned.

1. Liability limited to the par value of the stock. This makes the enterprise attractive to investors, and helps make it possible to accumulate a large amount of capital. But what is more important, it gives the enterprise a body of investors on terms that make effective management possible. If every investor was risking his whole personal fortune in the enterprise, he would insist on a powerful hand in its management. It is not possible to give each investor such power and operate a large modern enterprise successfully. Or if it were, there would have to be a small number of investors, which would defeat the purpose of securing a large supply of capital. The investor in a corporation thus exchanges some of his control over the enterprise for the greatly lessened liability.

2. This leads to the second advantage of the corporate form of ownership, namely, that it permits a concentration of executive power in the hands of the officers of the association. There is not so much concentration as in a one-man unit or in such partnerships as we have; but more than would be possible if large modern enterprises had to be handled on a partnership basis. Imagine operating a large organization like the Northern Pacific Railway with each of the present stockholders, or even one-tenth of this number, as partners.

3. The managerial staff usually consists in part at least of men who are officers and owners of the enterprise. This is likely to be true of the treasurer, who is likely to manage the financial end of the enterprise, of the secretary, and of the members of the board of directors. The general manager and his assistants are also likely to be large holders of stock. Assistants of this kind are better managers than the altogether hired assistants of a large one-man enterprise or partnership.

4. An executive body, made up like a corporation's executive body, with a president, board of directors and executive committee, is more likely to pursue a wise course of action than is a single owner or even a partnership group.

5. The easy transferability of ownership by simple sale and purchase of stock, and the long life of the charter with easy renewability, assure a corporation permanence and stability, enabling it to build its business upon a long-time basis, slowly and securely.

6. The easy transferability of ownership also makes corporations attractive to investors. Many business firms and people in private life are looking for investments which they can unload quickly when they need the money for other purposes. It is also an advantage to be able to sell out easily when one does not like the way in which a business is being managed.

7. The securities of a corporation are available in convenient denominations so that anyone with a small surplus in hand can always invest it. They are also available in different degrees of security from common stock to non-cumulative preferred stock, to cumulative preferred stock, to income bonds, to mortgage bonds, with different rates of return in proportion to the degrees of security. A common method of safeguarding investments is to buy stocks or bonds of several corporations—following the old adage of not putting all the eggs in one basket.

8. For several of the foregoing reasons, it is possible by organizing as a corporation to accumulate the large amounts of capital needed in modern industry.

9. It is easy not only to raise large amounts, but also small amounts in this way. This makes it easy to start new enterprises of all kinds—no doubt too easy, as will appear later.

It is also necessary to point out a few important handicaps of corporation ownership. The officers of the corporation are after all using other people's money as well as their own—frequently much more of other people's than their own—and they are not likely to be as cautious as might be as to how they use it. At least this has become the judgment of experience in the matter. Officers of corporations make better assistant managers than the out-and-out hired managers of a large one-owner enterprise; but they are not likely to be the equal of the owner managers themselves. Hence the true corporation is generally unable to operate on even terms with single ownership if the business is small. Also, after all, a board of directors and other officers

represents a good bit of "overhead" and consequent "red tape" in procedure, more of this than is warranted in a small or even moderately small business. Although the directors may assist a chief executive in making wise decisions, they also delay his decisions. Then there is the whole body of stockholders to deal with in all important matters of policy. Stockholders have a disagreeable tendency to see otherwise than their officers at times, and even to elect a new set of directors. It may be that their interests or objectives are different, or merely that they have too little knowledge of the business in which they have invested their money. It can very well be the latter. This difficulty is frequently overcome by various devices for keeping the real control in the hands of a few insiders. But when this is done, the officers have too much power—so much power that they often overreach themselves, ignore altogether the interests of the minority stockholders, and perhaps wreck the organization. No political potentates ever ruled with more abandon than does the invisible head of the select group in control of some of our large corporations. Lastly, the various groups of security holders may develop divergent opinions. All in all, this somewhat involved machinery of government of corporations has within it very great possibilities for divergence of interests and opinion, and even breaches ending in court action.

Yet in spite of these weaknesses, corporations are increasing rapidly in numbers and importance in most fields of business. The reason for this is that business units themselves are becoming larger. The growth of corporate ownership is partly a result of this increasing scale of operations; but it is also partly a cause of it—some such an organization device was needed to make large-scale production possible. The corporation has therefore played an important part in the tremendous industrial development of the last century.

Corporations are also coming increasingly into favor for moderately small enterprises—they are even being substituted increasingly for one-man units in certain fields. As long as the promoters have a majority of the stock, they are as secure in their control of the enterprise as if it were a partnership; and they have restricted their liability to the amount of the stock they own. There will be boards of directors and the like; but they can be largely ignored. The result is a one-man enterprise or partnership in effect without its principal disadvantage.

As an indication of the probable future trend in manufacturing

may be cited data recently published by the Census Bureau for twelve of the newer industries, including automobiles, electrical machinery and supplies, artificial ice, beet sugar, cement, phonographs, and fountain pens. An average of 74 per cent of the establishments in these fields are corporations, ranging from 54 per cent for fountain pens to 99 per cent for sugar beets. Table XXII shows the shifts to and from corporate ownership that took place between 1914 and 1919, in a number of typical industries. Apparently the small one-man shop is on the wane in the clothing industry. In specialty goods, however, like toys and jewelry, and goods involving simple manu-

TABLE XXII. CHANGES IN PERCENTAGE OF ESTABLISHMENTS OWNED BY CORPORATIONS BETWEEN 1914 AND 1919

Industries	*1914*	*1919*
Changing Rapidly to More Corporations		
Automobiles	86.7	92.7
Boots and Shoes	50.1	62.0
Fruit and Vegetable Canning	27.1	32.9
Men's Clothing	14.8	20.5
Women's Clothing	16.8	21.3
Hats and Caps (Cloth)	13.4	19.3
Leather	55.9	66.6
Paper and Wood Pulp	84.7	88.7
Saddlery and Harness	38.6	44.6
Soap	53.9	63.8
Tobacco, Cigars and Cigarettes	5.0	8.0
Changing to Fewer Corporations		
Automobile Bodies and Parts	48.7	38.0
Automobile Repairing	21.4	14.4
Writing Ink	42.6	37.7
Toys and Games	43.8	41.2
Changing Very Little		
Bookbinding	25.7	26.1
Engraving	6.2	6.0
Fur Goods	10.9	11.7
Jewelry	24.2	25.4
Millinery and Lace Goods	22.9	21.6
Printing and Publishing	23.8	25.7

facturing processes, like ink, and in shops depending upon local custom, like automobile repairing, bookbinding and engraving, corporate ownership is making little if any headway.

IV. EVILS AND ABUSES ASSOCIATED WITH CORPORATION PRACTICE

One cannot very well discuss the subject of corporations without referring briefly to some of the evil practices that have developed in connection with them. First of these is the promotion of fraudulent or doubtful enterprises. The corporation lends itself peculiarly to this sort of thing. A skillful, unscrupulous salesman can sell enough stock of almost any kind of an enterprise to get it started; and dividends can for some time be paid out of continuing receipts from stock sales. The enterprise must eventually go into bankruptcy, but in the meantime the promoters have paid themselves handsome salaries if nothing worse. Clearly fraudulent operations of this kind are easily punishable under almost any kind of criminal law; but it is often difficult to say when fraud exists. Corporations that prove in effect to be swindles are often started with perfectly good intentions. The fields of business most afflicted with such promotions are mining (including oil) and real estate—fields in which it is most difficult for the stock buyer to assure himself as to the facts, and most easy for the promoters themselves to be deceived. The accepted method of control of this evil is to pass a "blue sky" law prohibiting such promotion, and perhaps establish a state "security commission" or the like to enforce it. The difficulty with enforcing such laws is that one little state commission can not possibly investigate and pass upon all projected enterprises demanding a right to sell stock within the boundaries of any one state. All that they succeed in doing is heading off a few of the very worst cases.

Not so serious, perhaps, is the evil of floating a new enterprise with a larger capitalization than is represented by its tangible assets or reasonably anticipated earnings. This is commonly referred to as "stock watering." Enough stock may be sold to start the enterprise in good shape and the rest of the stock will be taken by the promoters themselves as pay for the promotion. A common arrangement is for the promoter to sell only preferred stock to the public, keeping the common stock themselves as pay for initiating the enterprise. And the common stock in such cases is likely to exceed the preferred stock, which assures the promoters control of the management. Some of the worst stock-watering has been in connection with combinations of enterprises. The corporation which buys out another may increase the capitalization of the combination by much more than the purchase price of the other enterprise, the difference being made up by common

stock which the parties to the transaction assign to themselves as fees for "swinging the deal." Lawyers who smooth out the legal difficulties in such transactions, and bankers who finance them, often receive a good part of their pay in the form of blocks of the common stock. By no means rare in the past has it been for enterprises entering into a combination to have their capitalization at least doubled. There have been cases where earnings have been increased enough to justify this; but in general the promoters of combinations have been altogether too optimistic. When a balance sheet of such enterprises is made out, it must of course show assets of some kind to offset the stock liabilities. This is done by padding the valuations of the physical assets, and by entering items for goodwill, patents, trademarks, "going value," franchise values and other intangibles. In some enterprises, over half of the assets and all or most of the common stock are represented by these intangibles. The first evil connected with such practices is that the real investors are robbed of their rightful dividends. The earnings of the corporation must be distributed over all the common stock outstanding, watered or otherwise. The security of the investments is also greatly impaired. If the enterprise is successful, it also has the effect of covering up the real rate of profits. The railroads of the country in times past have done a great deal of stock-watering. This finally led to the passage of an act calling for a complete physical valuation of all railway properties. This was thought to be necessary before the Interstate Commerce Commission could determine the reasonableness of rates for railway service. The accepted method of control for this evil practice is the same as for fradulent promoters; but it is not very effective. Public utility stock issues are made subject in most states to review by special public utility commissions.

As already suggested, the corporation has fallen down badly in the matter of its internal government. In theory, it is supposed to represent democracy in industry. It has really become thinly veiled financial autocracy in many cases; in others, autocracy with nothing but the threat of interference from its stockholders to hamper its freedom. The leaders of big business tell us that only on this basis can a large enterprise be operated successfully, that the stockholders have to be largely dispossessed of their supposed rights before the real management can safely undertake to carry out its plans. Other leaders of financial thought, on the other hand, are insisting that corporation laws should be changed so as to enfranchise the stockholders

again. This seems like a hopeless task. The alternative plan is to assume that the stockholder is merely an investor, and set up public machinery to protect his investment.

Associated with such a grant of power is always a possibility that the insiders will manipulate the enterprise in their own interests rather than in the interests of all of the stockholders. There are numerous ways in which this can be done. A common method is that commonly known as "milking a corporation," in which a small group of the stockholders sets up an agency of its own for selling services or materials or supplies to the corporation at high prices. Sometimes this agency takes the form of a subsidiary corporation, sometimes of an entirely independent corporation. In railway financing, railway extensions have often been built on this basis and sold to the parent company at exorbitant prices. Another form of manipulation is to hold up dividends and do other things to depress the market price of the stock of the company, and then go into the market and buy; or by contrary means boost the prices of the stock and then sell. In the very nature of things, the financiers at the helm of our large corporations are likely to be more interested in the security market than in the prices of the commodity they are handling, and the technique of production. The effect of this is to prostitute the true purpose of a producing enterprise.

V. UNUSUAL TYPES OF OWNERSHIP

Other Types of Ownership—Historically, the corporation was preceded by the *joint-stock company*, and organizations on this basis are still occasionally set up. A joint-stock company is something like an expanded partnership with transferable shares like a corporation, but without the legal status of a corporation, and its power to sue and be sued as a single unit, and in general to transact business like a person. Liability in a joint-stock company is usually unlimited; but practice in this matter varies with state laws.

A few states provide for limited partnerships in which the essentially "silent partners" are given limited liability as in a corporation. The same principle is in some states carried a step further and all the partners are given limited liability. There may go with this the power to sell one's share in the partnership without causing it to be dissolved. These two unusual forms of ownership are mentioned merely to show the possibility of providing in the law for almost any kind of ownership that may seem desirable.

VI. THE COÖPERATIVE

By all means the most usual other type of business unit is the coöperative organization. This may take the form of a *corporation with capital stock, a corporation without capital stock,* or of a *simple membership association.* The essential idea of all coöperatives however organized is *management in the interest of those who do business with or through the association rather than in the interest of those who furnish the money to start the enterprise.* Thus in a coöperative association for selling live stock, the proceeds from the sale of the live stock over and above the actual expenses connected therewith are all prorated back to the individual farmers furnishing the live stock. There are no "profits" to distribute. The service is rendered at cost, and each member pays exactly for the service which he receives. If the organization needs capital, it may borrow it on the joint security of all the members, or may sell shares of stock to the members. If the latter plan is followed, the organization becomes a capital-stock coöperative corporation. To make certain that no profits will accrue to the holders of this stock, the rate of dividend on stock is limited in the by-laws to a reasonable figure, usually 6, 7 or 8 per cent. The other essential idea of coöperative organization is democratic control by the members. In the membership association and the non-stock corporation, this is secured without any special arrangement—each member can have but one vote; in the capital-stock coöperative, it is secured by allowing each member one vote regardless of the number of shares he owns. To make democratic control still more certain, the number of shares that one member may own is usually limited in the by-laws. It is ordinarily said that the three cardinal requisites of a true coöperative corporation are *the limiting of voting to one vote per member, limiting the dividends on stock,* and *limiting the number of shares that one person may own.* It is apparent that the capital-stock coöperative is simply a modified corporation. In many states coöperative associations embodying all or most of the necessary principles may be set up under the general corporation laws. Special laws providing for such incorporation have been passed in most states whether they were needed or not.

The non-stock coöperative is a more recent development. It came partly in response to a felt need for a form of organization that was clearly non-profit on the face of it; and partly to serve in cases where very little stock was needed. Special laws usually had to be passed

providing for it. About thirty-five states have such laws at the present writing. Coöperative enterprises needing capital but wishing to organize upon a non-stock basis usually arrange for this by specifying a given amount of liability in the by-laws which every member assumes upon signing the membership roll. Short-time needs for capital may be supplied from loans secured by the members' produce. Reserves may also be built up by deducting small amounts from the returns of the members. It should also be stated that the membership fees in non-stock corporations are sometimes as high as $10 to $25, and this provides some working capital at the start.

Simple membership associations develop in cases where no capital is needed because no plant is required, and nothing must be paid for till after the proceeds are received. Some coöperation, such as that of many buying clubs, is so informal that articles of association are not even drawn.

The first successful coöperative organization was started by a group of weavers at Rochdale, England, in 1844. It was a coöperative corporation on the capital-stock plan, and embodied the three cardinal requirements of a coöperative corporation. The purpose of its founders was to reduce the cost of groceries. Its business methods at the start were like those of any other store—it bought in the same markets and sold at the same prices as its competitors. The difference came in the distribution of "profits" at the end of the year. All except enough to pay a reasonable dividend on the capital stock was prorated back to the members as a "patronage dividend" in proportion to their volume of purchases. Sales were made to non-members also; but non-members were returned patronage dividends at only half the rate paid to members. The purpose of this arrangement was to secure the business of the non-members and gradually draw them into the organization. This store succeeded from the start. Other stores were soon organized. Eventually a "coöperative wholesale society" was organized to take on the buying end of the business. The movement spread all over the civilized world. There are relatively fewer coöperative stores in the United States than in Europe, and yet there are over 2000 in the United States.

Presently the same form of organization was taken over by farmers and applied to selling grain, milk, and potatoes. The plan of doing business was the same at first. The farmers were paid competitive market prices for their grain and milk when they delivered it. The grain elevators still largely follow this practice. Creameries and

live stock shipping associations, however, presently began to sell their produce in the market for what it would bring and return the proceeds less costs of handling to the members. This method is called *pooling*.

The coöperative principle soon came to be applied in other fields of endeavor—credit, insurance, telephones, motor transportation, and many phases of production on the farm. There are at least twelve thousand farmers' coöperative marketing associations in the central states, with a total membership of approximately 2,700,000 farmers, and handling in 1925 approximately $2,500,000,000 worth of farm products. About 30 per cent of them market grain principally, 20 per cent dairy products, 16 per cent live stock, 12 per cent fruits and vegetables, and the rest principally cotton, wool, tobacco, nuts, poultry and poultry products.[1] Over two hundred of these associations are large associations operating in the central markets. The movement has outgrown its local phases and is making its most rapid progress at present in central market selling.

The coöperative type of organization has a number of advantages which make it especially adopted to certain types of business situations, and which account for the remarkable swing toward coöperation in certain fields.

1. The members of a coöperative marketing organization feel more certain that they are getting all that their produce is worth than they would if they sold to a private buyer. The farmers of the United States are not generally going to be satisfied to take a price offered them by a private middleman even though he may be paying more than a coöperative organization would pay. How do they know that it is more? The coöperative is organized on a non-profit basis. Its books are open to inspection, its accounts are audited and any earnings on hand at the end of the year are distributed.

2. Because of the foregoing, farmers will deliver more produce to a coöperative enterprise than to a private one. They are willing to give a coöperative enterprise a monopoly of their business, but not a private buyer. Hence coöperative organizations tend to grow larger than their proprietary competitors, and to have lower handling costs in consequence. This is working out in central marketing even more than in local marketing. A number of large coöperative organizations operating in the central market handle well over half of the total production of their commodity.

3. Members of coöperatives are more easily interested in improving

[1] *Agricultural Coöperation*, Vol. IV, pp. 111, 135, U. S. Department of Agriculture.

the quality of their produce than are the customers of a private marketing business. They feel more certain that the extra prices received for better quality will be reflected back to them. More important than this, a large coöperative organization, having under contract the product of several thousand members, can safely undertake to educate its members in improving quality. A private buyer is never sure that some other buyer will not reap the rewards of it. A coöperative thus organized can also grade the produce of its members and pay according to quality, whereas a private buyer who grades any farmer's produce down is much in danger of losing his custom. Not only can a coöperative improve quality, but it can standardize it as to type and variety—for example, it can induce the potato growers in one district to grow only two or three best standard varieties in place of twenty.

4. The larger volume of product under one management makes possible many of the economies of large-scale production which will be pointed out in a later chapter.

5. The members of a coöperative are joint managers of their organization in a much more real sense than are the stockholders in an ordinary corporation. They are at all times more closely in touch with its affairs, or if they are not, this is a serious defect in the management of their organization. Wherever this contact between the members and the governing board of the coöperative is maintained, the members are constantly learning more and more about the business of marketing and its relation to production.

It will be noticed that all of the advantages grow out of the essential nature of the coöperative type of organization—democratic control by and in the interest of the members.

But there are a number of important weaknesses of coöperatives traceable to the same source: the most important one is that too democratic control sometimes handicaps the central management in carrying out good business programs. The members are too poorly informed in business affairs to make wise decisions; but they make them anyway in spite of the counsel of their officers and those who are most closely in touch with the business situations. A few years ago the officers of a raisin marketing organization advised, in view of the depressed state of the market and the large crop of raisins, that the crop be offered for sale at a reasonably low price. The members could not be convinced. They wanted the same high price they had been getting. The result was that a large part of the crop was left on hand

at the end of the year. The central management is also handicapped at times in not being able to make decisions as quickly as should be. Of similar nature is the disposition of members of farmers' coöperatives to think that almost anybody can manage a business organization and to tolerate lax business methods. Because of reasons of this sort, many coöperative associations are failing each year. The United States Department of Agriculture has records of over a thousand that have failed, mostly since 1920. But over two-thirds of the farmers' coöperatives in the United States have been organized since 1915.[1] It is doubtful if the mortality rate is as high for coöperatives as for similar types of private enterprises.

Although the coöperative type of organization is much more prevalent in the marketing of farm products than anywhere else, this need not always be the case. There is every indication that business units of many other types will combine increasingly into coöperative organizations. This phase of the matter is discussed in Chapter XXIX.

SUGGESTIONS FOR FURTHER READING

Further discussion of the forms of business organization may be found in Chapter XIII of *Outlines of Economics* (1919), by Richard T. Ely, Chapter XVII of *Our Economic Organization* (1921), by L. C. Marshall and L. S. Lyon, and Chapter X, *Principles of Economics* (1917), by Henry R. Seager.

Alfred Marshall's *Industry and Trade* (1919), Book II, Chapter VIII, deals particularly with the corporate form of organization.

Willard L. Thorp in *The Integration of Industrial Operation*, Census Monograph III (1924), Chapter V, discusses the shifting in type of business organization.

The coöperative form of organization is discussed in Vols. I to VI of *Agricultural Coöperation*, published by the Bureau of Agricultural Economics, United States Department of Agriculture.

PROBLEMS

1. List the advantages and disadvantages of each type of business unit discussed in this chapter.
2. In which type of organization is control the strongest? In which type weakest? Why?
3. Give an example of a business which is particularly adapted to each of the types of business organization discussed. Explain why.
4. When a construction company is awarded a contract for the erection of a large structure, it frequently organizes a separate corporation to carry on the work of completing the project. Why?

[1] *Agricultural Coöperation*, Vol. IV, pp. 87, 135, U. S. Department of Agriculture.

5. When a large business organization builds its own building, it often organizes a building corporation which retains title to the building and rents it to the business enterprise. Why?
6. Suppose you could purchase an interest in a partnership or could buy stock in an equally prosperous corporation, in neither case participating in the actual management of the concern: which investment would you select? Upon what would you base your decision?
7. What is meant by "par value?" Why does a common stock having a par value of $100 sometimes sell for $120?
8. In what respects do the following differ: common stock, preferred stock, mortgage bonds, collateral bonds?
9. What is the difference between cumulative and non-cumulative preferred stock?
10. Is the type of security any real index of its safety or must you examine other factors?
11. Would the common stock of some corporations ever be preferable in point of safety to the mortgage bonds of other corporations? Explain.
12. What is a "blue sky" law? Has your state legislature enacted such a measure?
13. What types of businesses are particularly adapted to the coöperative form of organization? Why?
14. What are the essential principles of the true coöperative organization?

CHAPTER XIX

THE DIFFERENTIATION OF MANAGEMENT

This chapter has to do with the function of management. Management, according to the definition in Chapter XVI, consists of the directing of the labor of others and the laying out of work and the planning of organization and choosing of administration policies. Also according to Chapter XVI, there are two kinds of managers, hired managers and entrepreneurs, the latter being managers who handle their own enterprises. For the purposes of this chapter, both classes of managers will be considered as one.

Small businesses, as already pointed out, need so little managing that one person is able to encompass all of it without difficulty, and a very large number of them—for example, small retail stores, farms, etc.—do not need the full time of even one man. In such circumstances, the problem is that of the economy of combining labor and management in one person.

In larger businesses the amount of managing to be done becomes more than one person can handle, and in such cases the problem arises as to the best way to divide this management. In this division of management, the tendency to specialization becomes at once apparent. What we shall discuss mostly in this chapter is therefore *specialization in management.*

The Combination of Management in Small Enterprises.—But first let us consider the problem of combining labor and management as it arises in a small business. There are many obvious advantages of having labor and management combined in one person. Under such circumstances, the manager is sure to be closely in touch with every detail of the business. If he is not actually performing these details himself, he is near at hand or is handling some closely related details. In a retail store, he will wait upon part of the customers, take part of the telephone orders and fill part of the delivery orders. All complaints will come immediately to his attention. The other important advantage is that the management can be combined with labor in such a way as not to interfere with it greatly. A good deal

of the store managing can be done during hours when trade is slack,—such work as checking over records and stocks of goods, writing letters, looking after bad accounts, planning sales, writing advertisements. A good deal of the buying can also be done at such times.

A farm or a shop illustrates the same two advantages of combining labor and management, with perhaps the additional circumstance that much of the labor done by the manager is of such a sort that it leaves the mind free to exercise itself over the details of management. The operator of a tailor shop has abundant time to do his planning while he is sewing; the farmer while he is following the plow or milking, or driving to town and back with a load of produce.

The principal disadvantage of this combination is that the qualities required for good management and good workmanship are frequently not found in the same person. There are many excellent retail salesmen who have found to their sorrow that they do not succeed as operators. There are many high-grade tailors, butter makers and barbers who do not manage very well. On the other hand, there are successful managers who are poor technicians. If the business is very small, so that one man handles all of both labor and management, it therefore frequently happens that a business fails to succeed just because the operator of it is not sufficiently good in both labor and management. If the business is large enough to use several persons, the deficiencies of the manager as a technician will not be noticeable and will not interfere greatly with the success of the whole business. In such a case, the manager can be chosen principally on the basis of his skill as a manager, and the other employees solely on the basis of their skill as technicians.

We shall see later that for small and moderately small enterprises the advantages of combining labor and management in one person generally outweigh the disadvantages, and that this is one of the things that is responsible for the persistence of the small business unit.

The Nature of the Problem of Organization.—The job of managing a large enterprise is mostly of the same composition as the job of managing a small enterprise. The difference between the two is mostly in the amount to be done rather than in the kind of things to be done. The manager of a small enterprise has to look after the work of a few men to see that it is done properly; and the manager of a large enterprise has to look after the work of a large number of men to see that it is done properly. The manager of a small enterprise

buys or supervises the buying of a small quantity of raw materials and supplies; and the manager of a large enterprise, of a large quantity of raw materials and supplies. But although the two jobs of managing are largely of the same composition, they are not altogether so. A large organization requires that more detailed records be kept, that more reports be prepared and examined, and that more time be given to the coördinating of tasks and departments.

It will be well for us at this point to examine in some detail the problem of organization for production on a large scale. Following are enumerated some of the most important aspects of it:

First of all, a large enterprise has a volume of product that warrants a considerable degree of specialization. First, there will be the major specializations, amounting virtually to specialization by occupations, between the office work and the manual work; then between the record and accounts work and the filing, the correspondence, and the buying and selling; then between those who work upon the product itself and those who work upon equipment and supplies and the like. Finally, each of these major classifications will probably be split into a considerable number of tasks. Working out the details of any plan of specialization is one of the major problems of organization of a large enterprise. It is a problem upon which the managers are almost continually at work. Each successive reduction in the costs of manufacturing Ford automobiles was accompanied by a considerable re-division and re-combination of operations.

The next problem is that of assembling these detailed tasks and functions into groups or departments, of developing a proper *structure* for the organization. This "departmentizing" can be done on the basis of *functions*, or of *sections of the plant*, or of *number of workmen*, or of *crews*. These different bases of departmentizing will be discussed in detail in a later chapter—they constitute one of the major problems of all organization.

The next problem in logical order is that of the *coördinating* of the departments, of seeing that they fit into each other properly, that each runs at the right rate to supply the needs or take care of the product of the others; that each is rendering exactly the kind of service that is suited to the needs of others; that the "production" department is turning out the kind of product that the selling department can market to best advantage. In large organizations, departments frequently fail to work together to best advantage; they even get out of sympathy with each other; as if, for example, the library and the

teaching departments of a university were to get out of sympathy with each other and refuse to coöperate.

Always a major problem, in a large organization especially, is that of keeping the manufacturing and the selling program properly related, in the first place, so as to have an adequate supply of goods ready when the market will take them, and no more than an adequate supply; and in the second place, so as to have costs and prices in such relation to each other that the total net factory income is greatest over a period of years. Goods can usually be sold if the price is put low enough; but will this price leave a margin of profit? What margin of profit per automobile times number of automobiles sold will yield the largest net returns? This is obviously one of the most difficult of all management problems. Small enterprises have it as well as large ones; but not in such a pronounced form.

For several of the problems already mentioned, as well as for others to come, an adequate system of records and accounts is a prime requisite. The manager of a very small business may conceivably keep in a checkbook, a letter-file, and his head about all the records of his business that he needs. In a large business, a definite record must be kept of all expenditures and receipts, of daily production by departments, and of stock of supplies and of product on hand. Not only must these records be kept, but they must be analyzed in such a way as to furnish the information desired. If the costs of the product are rising, the analysis of the records should show it. If a particular stock of raw materials is showing a good deal of waste, the records should show it. If sales are falling off in a certain territory, the records should show it. As a matter of fact, they also ought to show *why* costs are rising and *why* sales are falling off. It is usually not enough merely to know that certain things are happening—one must know why they are happening before one can take advantage of them or prevent them.

In a large enterprise, special provision must be made for looking after the plant and equipment. It is no longer possible for the manager to inspect every piece of machinery in the plant and see that it is in good working condition. He must therefore delegate this function to others working under his direction.

Neither is it possible in a large enterprise for the manager to look after the work of each employee. This is the place where the greatest load upon management comes, where the resources of one-man management first reach the limit of possibilities. It is on this side that management is most expanded in a large enterprise. We can therefore

look into this aspect of large-scale management in considerable detail. If men at work are going to be properly managed, the following are essentials:

a. They must have work planned and laid out for them.

b. They must be put to work and directed as to how the work is to be done.

c. In some cases, they must be trained or instructed systematically.

d. Their work must be inspected to see that it is properly done.

e. In many cases, especially if the work is done on a piece-rate basis, a record must be kept of each man's work.

f. The men must be kept interested in their work. One of the essentials of successful factory operation is a proper *esprit des corps* among the workers, that is, a spirit of coöperation between workers, and between workers and management, and a desire on the part of the workers to make the enterprise as successful as possible.

g. In a large enterprise, some system of "hiring and firing" must be developed. In the first place, some one must actually do the hiring. If he is to do this properly, he must have some way of knowing exactly how many and exactly what kind of men are wanted and for what operations. He must also know what wage he is to be allowed to offer. The person who is to do the firing must clearly understand his prerogatives in the matter; and all parties concerned must clearly understand that he has these prerogatives.

h. Last, but not least, the men must be kept from soldiering.

Experience in the managing of large enterprises has made it abundantly clear that responsibility must be definitely placed for everything. If the manager cannot look after the machines to see that they are in good working order, and after each man to see that he is doing his work right, he must have some one whom he can hold responsible for it. In some cases with large enterprises, this will involve several stages in responsibility; that is, one man will be responsible for a given thing to some person above him in responsibility, and this person in turn will be responsible for this same thing, along with many others, to a person still above him in responsibility, this person being perhaps the manager, or perhaps some person between him and the manager. Thus it can be said that there are "lines of responsibility" radiating out from the manager to every department and sub-department of the plant's operations, in the last analysis, clear to each individual worker, who in a sense is responsible to his "foreman" or "boss" for his particular detail of the work.

Closely associated with lines of responsibility are "lines of authority." In any large enterprise, each worker must clearly understand from whom he is to take orders, and to whom he is entitled to give orders. There cannot safely be two persons giving orders of the same general sort to one person; for if there be two such persons, their orders are likely to conflict at times. Even the manager himself should ordinarily give his instructions to workmen through those whom he has set up in authority between him and the workmen.

In any large enterprise, there must be a regular plan or procedure or *system* for doing everything. A one-man management can handle each individual case as it arises according to the particular circumstances connected with it. Even in a large enterprise, special treatment will have to be given to some cases. But the regular run of cases must be handled in a regular way. This is necessary in the first place as a time-saving device; in the second place, so as to make it possible to arrange a system of keeping record of operations; and in the third place, so that responsibility can be clearly traced. Thus each letter that the company receives follows a particular course; each order that is to be filled is handled in a certain definite way; also each workman who is hired; and each new supply of raw materials. As a part of such system, special forms or blanks are prepared and passed from department to department and filled in or checked as the order or letter goes on its way. A common but opprobrious name for system is "red tape." It is true that system may easily be carried too far. It undoubtedly is in many large organizations, especially of the public or governmental type. System is always likely to be more or less annoying to the people who have to work under it, especially for a new workman while he is getting acquainted with it and before it becomes a matter of habit. But on the other hand, lack of system where it is needed is even more annoying and time-consuming.

Types of Managerial Activity.—If we look over the foregoing account of the management problem, we shall find in both small and large enterprises, but more especially in large enterprises, that there are involved in it many different kinds of activity, ranging from the relatively simple and clear-cut, to the very involved and uncertain. Let us list these types of activity roughly in order from the simplest to the most involved:

1. Directing the workers and inspecting their work.
2. Keeping a record of each man's work.

3. Laying out the work—that is, planning its final details.
4. Looking after machinery and plant.
5. Hiring and firing ordinary workmen.
6. Handling complaints from workmen.
7. Planning the work of the departments, that is, working out the best subdivision of tasks, the type of workers needed for each task, the type of equipment needed for each task, etc.
8. Working out the system for handling letters, orders, complaints, etc.
9. Planning the kinds of records to be kept and working out methods of analyzing them.
10. Planning the sales campaign and supervising the selling and the handling of complaints from customers.
11. Outlining a policy of credit to customers, and supervising its execution.
12. Buying supplies and raw materials, or perhaps only supervising this.
13. Arranging for loans.
14. Determining the structure of the organization, that is, what departments there will be, and how they will be related to each other.
15. Keeping the various departments properly coördinated at all times.
16. Occasionally planning new plants and equipment.
17. Hiring department heads and the like.
18. Keeping the whole business, its volume of output and the like, properly adjusted to changing business conditions, foreign and domestic market outlets, etc.
19. Determining the general long-time policy of the business, in such matters as what products to manufacture, what type and qualities of products to manufacture, what class of customers to seek, what tactics to employ in dealing with labor, whether to enter politics and seek for political and legislative advantages, and if so, what public measures to espouse.

These various managerial activities not only differ in degree of complexity, but in the type of ability which they call for. The type of ability required for negotiating loans is probably not the same as is required for supervising the selling or for hiring workmen. The type of ability required for planning operations is probably not the same as that which is required for analyzing records. It stands to reason, therefore, that whenever a business is large enough to need several

people in its management, specialization in management will begin to appear; that certain of the foregoing types of activities will be performed by certain individuals with suitable talents or training for them; and that certain others will be performed by other types of individuals with other aptitudes and training. The larger the business, the more complete this specialization in management. In fact, in very large businesses, it may be carried nearly to the point of having different individuals doing each of the nineteen different types of activities listed above.

For some of these managerial activities, training is a prime requisite. Planning and analyzing records and analyzing market outlets are examples of this. For others, natural ability and special aptitudes are of most consequence. Buying and selling and determining general business policy are examples of this. For all of them, experience is more important than anything else; in many cases, experience in this particular plant, or in one of a similar type turning out a similar product. Experience not only develops skill and technique in performing the tasks, but it provides the individual with the knowledge of men, materials and equipment which is so badly needed in every business. Proper training puts the individual in a condition to acquire this knowledge more readily and to make a better utilization of it once it is acquired.

Delegation of Management.—All of the foregoing activities may be looked upon as in a sense derived from the one-man management. At least, as a business grows, the manager gradually gives over one after another of these various managerial activities to subordinates. At first, he may simply divide up his plant into sections of some sort and put a foreman or boss in charge of each section, whose business it is to look after the men and equipment in his section. He may soon find that he cannot look after all his foremen properly and all his other managerial duties at the same time. He may then hire an assistant manager and turn over to him some of the more routine of his activities. Or he may engage a head salesman to relieve him of supervising the details of the selling. Or he may designate some one to supervise the records and accounts; or put some one in charge of the office work. In such circumstances, it is customary to say that the manager has "delegated" some of the management to subordinates. As head manager, he is still responsible for the proper performance of these tasks—if he is a hired manager, he is responsible to his employer; if he is managing his own enterprise, he has to take all the consequences

himself of whatever his subordinate managers may do. At the same time, however, he has made all of the subordinate managers responsible to him for what has been put under their control—he has delegated to them part of his responsibility. The larger the business, the more specialization in management, the more management that will be thus delegated.

No matter how large the business, there are certain managerial activities that are seldom satisfactorily delegated, namely, those named at the end of the foregoing list, particularly Nos. 17, 18 and 19, and in most cases, Nos. 14 to 16 besides. These are functions that require a comprehensive grasp of the whole enterprise and of its relation to the outside world that are not likely to coexist in the person of anyone except the head manager himself. The United States Steel Corporation, no doubt one of the largest organizations in existence, has never delegated many of these activities to subordinates. The mere fact that activities of this kind cannot often be delegated is one of the principal checks upon the size of organizations.

The practical problem arising out of the foregoing circumstances is that of what managerial activities to delegate, and how far delegation can be carried, in any given set of circumstances. The personality of the head manager and his assistants, their particular aptitudes and abilities, the type of enterprise, the kinds of skill required in the ordinary employees, are all factors influencing the solution of this problem. Delegation of management is one problem for a shoe-manufacturing business, and another for a department store; one problem for a construction company, and another for a railroad company.

Various plans for arranging delegation of management will be discussed in Chapter XXI.

SUGGESTIONS FOR FURTHER READING

Russell Robb's *Lectures on Organization* (1910), discusses the question of differentiation of management. Further treatment of the subject may be found in L. C. Marshall's *Business Administration* (1920), Chapter IX, and in Section C, Chapter XII, of *Readings in Industrial Society* (1918), by the same author. Readings on the function of management may also be found in Chapter VI, Section B of *Materials for the Study of Elementary Economics* (1913), by L. C. Marshall, C. W. Wright and J. A. Field. D. S. Kimball discusses the subject in Chapter XVI of his *Principles of Industrial Organization* (1919).

PROBLEMS

1. Are the conditions essential to specialization of management the same as those essential to specialization by tasks? Explain.
2. Can specialization of management be carried as far as specialization by tasks? Explain.
3. Is management proportional to size of business or does it increase more rapidly? How does this affect management costs per unit of output?
4. Some people sum up the difference between large and small enterprises by the expression "more red tape". Is this a cause or result of the differences? Explain.
5. When people say there is too much "red tape", do they mean that the business is over-managed or something else? Explain.
6. It is reported that during the last depression, Henry Ford discharged about half of his office force and sold over a trainload of office furniture. What may he have gained by such action?
7. Many factories have posters about their building showing pictures of United States Army activity and bearing inscriptions such as, "Some must give orders and others must obey". What is the purpose of such posters?
8. Many big business men say that the farmer is responsible for his own hard times, that if he would only use business methods and keep records, he could make money. Comment on this statement.
9. Why is it possible to get better fits of capacity and efficiency in the management of larger than of smaller enterprises?
10. The average salary paid to all those whom we would classify as managers is not very large; but a few receive large salaries. What does this show as to the supply of managerial ability?
11. A fruit farmer in California went bankrupt. His farm was bought by a corporation and run by a hired manager and proved a success. What does this prove?
12. What delegation of management is there in a small retail grocery? A large retail grocery? A college administration? A construction job?

CHAPTER XX

ORGANIZATION FOR OPERATION

Organization for Operation.—We are now ready to take up the details of organization of an enterprise from the standpoint of its actual operation. This involves two phases, one, that of its *business unit organization*, and the other, that of its *departmental organization*, *lines of authority* and the like. The first considers such questions as the duties and functions of the officers of the corporation, the board of directors and the members; the second, such problems as whether to organize operations on a functional, territorial, or crew basis. We will consider the business-unit phase first.

I. BUSINESS-UNIT ORGANIZATION

The chapter on the business unit outlined the general features of organization for administration of each of the three major types of business units. This chapter will take up the details and present the principles involved. Business-unit organization concerns corporations principally.

Corporations.—The administrative control of a corporation is in the hands of the board of directors and other officers of the corporation, subject to a certain amount of direction and review from the body of stockholders. In legal theory, at least, the body of stockholders is the final authority. It may, however, delegate to the board of directors and the other officers almost any authority which it sees fit, and it usually does delegate a great deal of it. The by-laws drawn up when the corporation is formed, and in effect subscribed to by everyone who purchases a share of stock subsequently, contain all necessary clauses empowering the board of directors and officers to act in behalf of the stockholders upon many important matters. Upon still other important matters, the board of directors and other officers customarily take action, subject to later approval by the stockholders. The by-laws also specify certain powers and duties of the president, secretary and treasurer of the corporation. This enables them to act upon routine matters without securing special approval of each one of the board. The by-laws also frequently empower the president to act upon matters requiring immediate decision without even calling a

meeting of the board; or he may act upon them and take a chance upon securing the approval of the board later.

There are two needs of good business administration more or less at odds with each other here. One of these is the need for *dispatch;* the other is the need for *wise action.* There are some matters upon which a corporation can afford to deliberate a good while before finally coming to a decision. These can be brought up at the regular meetings of the board, perhaps at several successive meetings, and even referred to the stockholders at the next annual meeting. But there are many others which require quick action, even though it may not always be the wisest action. The board of directors cannot very well be in session all of the time. To call the board may require more time than is available, and the board may take considerable time to debate the issue after it convenes. In such circumstances, action without the board's approval is generally advisable. But if the president is given a free hand in such cases he may take more and more decisions upon himself, leaving the board with very little to do, or he may think that quick action is needed in many cases when the board of directors may not. If the president is in full sympathy with the board and has demonstrated that he can and will make wise decisions in accord with their general wishes, they can do no better than to let him expand his functions. It is probably advisable to make all interim decisions of the president subject to later approval of the board. The president will then consider his decisions much more carefully, and will be sure of the support of the majority of his board before he acts. The board can be of a great deal of help to the president if it will adopt general statements of policy which can be followed as a guide in handling various sorts of cases that arise. If the president can demonstrate that his action was in accord with a generally accepted policy of the board, then he is safe. But no body of policy statements can be devised that will anticipate all the emergencies that are likely to arise.

The foregoing discussion has covered four different types of cases that may arise. These are as follows:

a. Routine cases—to be handled by the officers without consulting the board, but generally subject to its later approval.

b. Matters of fundamental policy which can be considered at length by the board and membership.

c. Cases requiring rather immediate action, but which can be provided for in part by general statements of policy adopted by the board and membership.

d. Genuine emergency cases of the sort that cannot generally be provided for in general statements of policy. These are generally handled by the president without calling the board, either subject or not subject to later approval by the board.

Under another arrangement, which is becoming rather common these days, the board creates out of itself, either with or without special sanction in the by-laws, an executive committee which is given interim powers to act almost equal to those of the board itself. This committee usually consists of the officers of the corporation, including the president, secretary, treasurer, and perhaps a vice-president or two, and perhaps the chairman or president of the board, if he is different from the president of the corporation. This executive committee is on duty constantly in any large corporation, and within calling distance in smaller corporations.

The other need of a good organization which is largely ignored in many corporations is the need for the coöperation of all the members. Some corporations still make an earnest endeavor to secure this coöperation and to maintain the democratic nature of their organization; but in general, as already pointed out, the modern corporation has moved a good ways away from this notion. The stockholders of corporations are being more and more looked upon simply as investors and not as members. The stockholders are frequently not closely enough in touch with the affairs of the corporation to vote intelligently. Often there is a controlling interest in the corporation so strongly intrenched that it does not need the votes of the small stockholders; and can ordinarily outvote any large stockholders on the opposite side in a fight for control. The control of most of our important corporations is settled largely by a few powerful interests in them who may be working together in harmony or at odds from time to time. It is to be presumed that these interests manage the corporation in the interests of the corporation, and therefore of all the stockholders, but there are any number of cases on record where this has not been done. In some cases, the corporation has even become subject to the control of bitter rivals; or to small groups who have manipulated its affairs solely to their own private gain.

The president of the corporation is usually in effect the "head-manager" of the organization. He may, however, give attention only to the major phases of policy, the virtual manager of the enterprise being some one bearing some such title as general manager or general superintendent. The president of the corporation may even

live far distant from the scenes of the company's major operations and only occasionally visit them. Thus the presidents of many mining companies live in the East, Boston being a particular center for them.

Coöperatives.—The problems raised in this section are especially acute with coöperative organizations, especially the large central market organizations. Their business is of such a nature that action must frequently be taken very quickly. If a large cotton organization receives a bid from a large manufacturer for 100,000 bales of cotton at a price a little under the then prevailing price, there is no time to call all the members together and let them vote upon it. And if the members were given a chance to vote on it they might very likely vote wrong; they do not ordinarily have enough understanding of the market to be able to make intelligent decisions on such questions. Consequently some coöperative leaders at present favor setting up a strong central board or committee with rather wide powers, in effect, copying the practices of those corporations which have largely disfranchised their stockholders. When this has been done, however, the results have usually been unfortunate. The "business men" versed in the methods of large corporate business who have been given the reins to carry out such a policy have been inclined to forget that the organization was set up by the growers of the produce to serve their interests. It is very easy for such an executive and the members of such an organization to acquire very different notions as to its interests and objectives. When this has happened, the new "business management" has been voted out of control at the next annual meeting if not sooner, and in a majority of cases, very properly so.

Two ways out of this difficulty of the coöperatives are being worked out. The first is that the coöperatives are learning to differentiate between the four sorts of cases mentioned in an earlier paragraph, are giving the central management more power to act in emergency cases, while still reserving to the membership all decisions in matters of general policy. The membership at the general meetings is laying down more necessary rules to cover routine cases and establishing more principles as guides to action in other cases. The by-laws of new organizations are increasingly more specific as to the manner of handling the different sorts of cases. The other solution of the difficulty is that more and more emphasis is being placed upon educating the members as to the aims and methods of the organization, and as to the details of the problems which it has to handle, and upon keeping

the members fully informed as to the affairs of the organization. This has two important results, one, that it enables the members to vote intelligently, and the other, that it preserves the confidence of the members in the ability and integrity of the central management. Most of the large coöperatives have "field service" departments which handle this phase of the work along with the work of improving the quality of the product and standardizing production.

Partnerships.—Partnership management is in effect committee management. Inasmuch as each member of the combination is responsible for all the acts of all the others, it would seem as if unanimous consent should be necessary before any action is taken. This is in effect about what happens; for if any action is taken which is contrary to the wishes of any member of the firm, it causes trouble between the members which may ultimately lead to dissolution of the partnership. This is especially likely to happen if the partnership consists of only two members.

In other cases, the partners agree among themselves upon a method of deciding policy and details of management. Such arrangements are frequently written into the partnership contract. The provision may call for unanimous consent, or approval by any two of the three partners. It is doubtful, however, if such provisions ever prove of much value. If the partners cannot all agree, or find a way of getting along together even though they do not agree—as is frequently the case—the partnership will not last long.

Another plan frequently followed in partnerships is to have each member of the firm assigned a particular department, and give him rather complete control over it. Thus one partner may do the buying and selling, another handle the accounts and finances, and another look after the plant. There will be need of coördinating these three departments of the work, and also of deciding many matters of general policy. But relatively few issues will arise with respect to these, and the chances of avoiding differences will be greatly improved over what they would be if all three members attempted to agree upon everything.

If a partnership handles a volume of business so large that it needs to delegate management, it is pretty surely to be organized upon some such basis as just outlined. Otherwise each department head would consider that he had several bosses, and would surely be placed in the embarrassing position at times by receiving conflicting orders from the different partners.

Committee management, such as a partnership represents, is not usually looked upon as good organization. There is likely to be altogether too much of conflicting policies and delayed decisions. Nevertheless, when a small group of men have really come to general agreement as to policy, or have learned how to thresh out their differences amicably, it may represent a higher order of management than one-man management or corporation management. A good working partnership can make as wise decisions as most corporations, and can make them almost as quickly as can a single entrepreneur.

II. DEPARTMENTAL ORGANIZATION

In the departmentizing of enterprises, two different plans of organization are involved, namely, the *functional* plan, and the *line* or

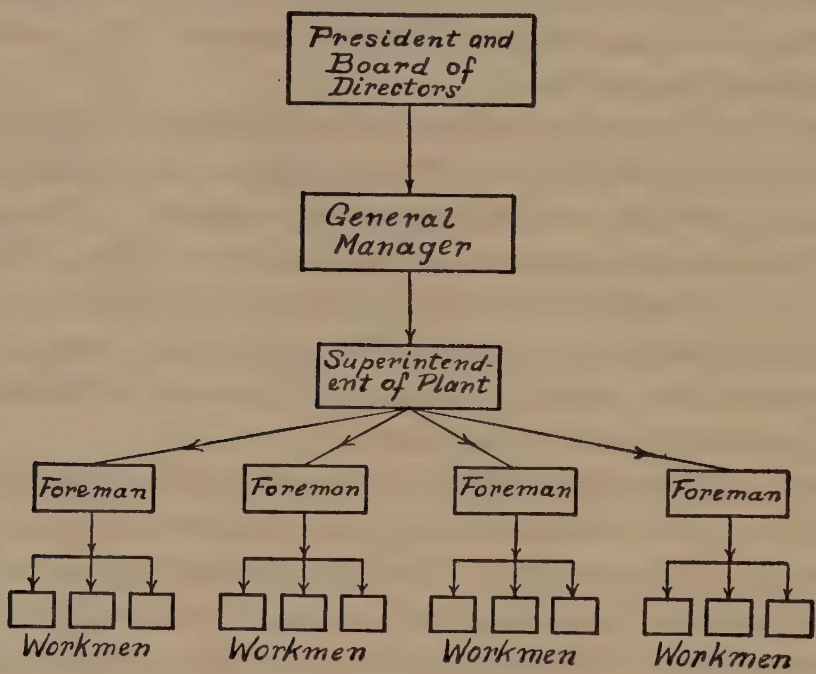


FIG. XLIII. Line or Military Organization.

"*military*" plan. An enterprise can be organized solely on one plan or the other; or upon some combination of the two plans. Most organizations are a combination of the two. Most combination plans are called "*line-and-staff*" plans.

Line Organization.—The line or military plan of organization is illustrated by the diagram in Figure XLIII. Under this plan, the lines of authority and responsibility run parallel. Each person in the organization takes orders from, and is responsible to, only one other person; and if he is in a position of authority, he alone gives orders to

those working under him. The president and board of directors transmit all of their orders to the general manager, and the general manager transmits them, with necessary adaptations to suit special conditions, to the superintendents of the various plants, and the superintendents transmit such of these orders as are necessary to the foremen of the various groups of workmen. If the company operates only one plant, there is likely to be but one person between the president and board of directors and the foreman, and he may be called either manager or superintendent. If the president of the company performs the general rôle of manager, the next person below him in line is generally called superintendent.

The strongest feature of this type of organization is the simplicity and directness of its lines of authority and responsibility. Such an organization possesses in high degree that quality of organization which is called *discipline*. It is therefore suited to enterprises employing a considerable body of men at temporary jobs, or at work whose operations are changing frequently. The type of all such organizations is an army. Every movement of every soldier in an army must be under complete control of the general in charge, for at any moment a change in enemy tactics, or in the tide of battle, may require a change in procedure. The only way to have this control is to have clear-cut direct lines of authority reaching from the general through brigade commanders and regimental commanders and captains down to the last man, and to have all of these thoroughly trained in performing all the maneuvers that are going to be needed in battle.

This military plan of organization makes a strong appeal to many "captains of industry." Until recently, many organizers of enterprises have looked upon it as a sort of ideal, to be aspired to and attained so far as possible, taking men as they are, and working conditions such as they are. More managers are now coming to recognize, however, that it has many limitations, and particularly that it is not suited in its pure form to the complex undertakings of to-day. Even a modern army finds that the pure "military" form of organization does not suffice for all of its needs, and functionalizes itself to a considerable extent.

Functional Organization.—The essence of the functional plan of organization is the setting up of special departments to do special things, to look after particular parts of the work. The modern army has its artillery and air forces as well as its infantry, its engineering department, its supply departments, its hospital department, and

even its legal department. Within each of these departments, and especially in the actual combat departments, there will be almost the perfection of military discipline and control; but the broad general scheme of organization is essentially functional.

A completely functionalized enterprise is one in which each worker in it looks to a different person for orders and instructions or help as to each phase of his work—to one superior for his day's orders, to another for instructions as to the technique of his operations, to another for repairs on the machine he is using, and perhaps to still another for any adjustments of wages or piece-rates or working conditions. The person to whom he looks for each of these is a specialist in exactly

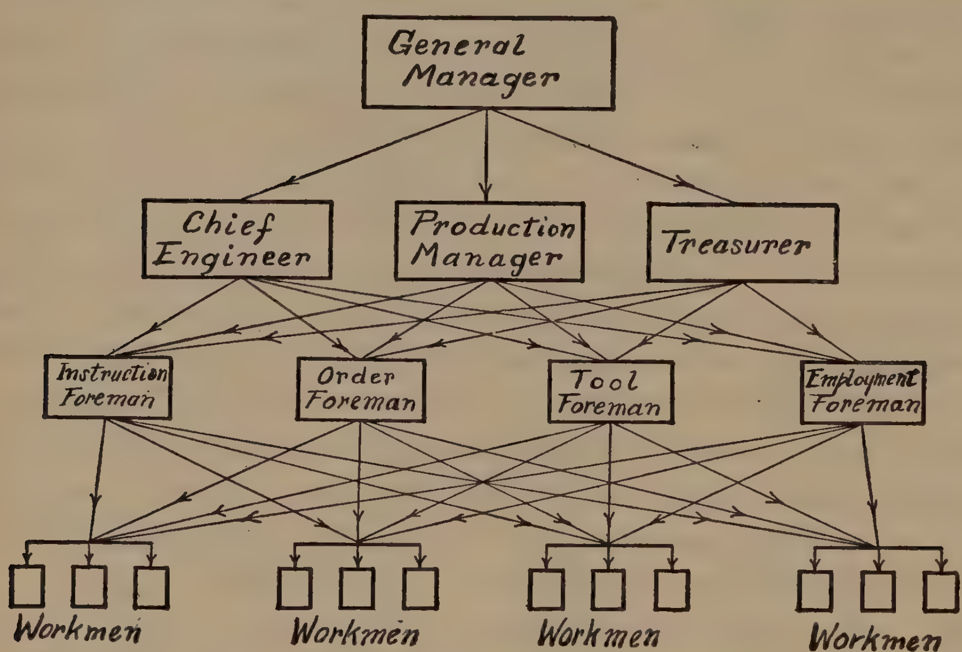


FIG. XLIV. Functional Organization.

this thing, that is, a person who does nothing else but this thing. Figure XLIV is a diagram illustrating a completely functionalized organization. The general manager gives one set of instructions to the chief engineer, another to the production manager, and another to the treasurer. The chief engineer's business is to analyze operations and work out the best subdivision by tasks, to work out the routing of the product-in-process, to plan and design tools and machinery, and to keep the equipment in good working condition. In order to put his plans into operation, he must have ready access to the workmen, but he could not possibly reach each of them himself personally; nor could his immediate assistants. Accordingly there is need that foremen be interposed between him and the workmen. But these

foremen are also specialists. One handles work orders, another looks after tools and machinery, another instructs the workmen as to the technique of their tasks, and the fourth hires workmen and adjusts rates of pay and handles complaints. The chief engineer will probably in most cases need to get in touch with all these foremen in order to carry out his plans. The new equipment will have to be worked out in close coöperation with the tools foreman; and the new subdivision of tasks in close coöperation with the instructions foreman. The work orders will have to be adjusted to the change in work procedure; and men will have to be refitted to tasks, and rates of pay adjusted accordingly.

Similarly, if the production manager finds it advisable to change the production program, perhaps to modify the product in some particular, or use somewhat different materials, or to speed up production for a short period, he will need to work out his program with the same four foremen.

Likewise if the treasurer finds it advisable to change his policy as to methods of hiring, or wage rates, or type of men employed, he will have to work out the details of it with all four foremen.

Now, very obviously, it would not do to have these three department heads working independently of each other. Before any change of any kind is undertaken by one, the consequences of it must be considered thoroughly by the others. As a matter of fact, they will always have been approved by the general manager, so that each department head understands that he must adjust his procedure to the changes instituted. In many cases, the change will come in the first instance from the office of the general manager, transmitted to him, perhaps, by the board of directors and the president. It is the business of the general manager to see that the instructions he gives to his department heads do not conflict with each other, and if they do, to smooth out the difficulties that arise therefrom.

The advantages of the functional plan of organization should now be apparent. It is a plan designed to permit taking full advantage of specialization, not only in the detail work of the enterprise, but also in management in all of its phases. An enterprise organized entirely upon the functional basis is an enterprise entirely of specialists.

As has been previously pointed out, specialization, particularly specialization by tasks, is possible or advantageous only under certain conditions. One of these is a considerable volume of a business, a volume large enough to use to advantage a full crew on the special-

ized basis. Another is that the operations be continuous, the same product being turned out day after day and month after month. Such conditions prevail in nearly all factories except small ones like creameries or local mills. Factories employing a few hundred men can usually adopt a more or less complete functional organization to their advantage, if such a plan is wise for other reasons.

But there are other reasons why a functional organization may not be wise in any given set of conditions. The functional plan of organization is obviously weak with respect to lines of authority and responsibility. It may be possible to formulate definite statements as to which foreman or division chief is responsible for any phase of the work; but borderline cases will constantly arise, which will either be neglected because each considers them included in the sphere of the other's activities, or which both may undertake to handle. Also the workmen will frequently be in doubt as to whom they are responsible to for the various phases of their work. Also there are a large number of problems which involve several specialists at the same time. Very obviously, also, if a functional plan of organization is to work, certain conditions are also essential to the organization itself. First of these is a clearly-worked out and clearly stated scheme of division of responsibilities. Second, is a group of division heads and other managerial specialists who coöperate on friendly terms. Third, is a strong executive able to secure coöperation from all of his division heads, and also able to impress his wishes upon them by other means if necessary.

The functional plan also requires more system and more records. As long as one foreman is solely responsible for what happens in his section of the plant, very little in the way of system is needed. Orders can take only one course, and that is from the manager through him to the workmen. Moreover, instructions and orders can be transmitted largely by word of mouth. But under the functional plan, a definite procedure for everything must be worked out, and every set of instructions must be reduced to written records. When instructions are coming from several different sources, it is too much to expect of the ordinary workman or even foreman that he will keep them all clearly in mind and separate. Hence they must have a written record to which they can refer.

Intermediate Types of Organization.—The intermediate plans of organization cannot be generalized as can simple line or functional plans. They occur in all sorts of variations and degrees of functional-

ization. Figure XLV shows a plan which is functionalized at the top and down as far as the foreman, but not clear through to the workmen. The ultimate unit is the foreman with his group of workmen. The workmen receive orders and instructions from only one source, their foreman. They even arrange the terms of their employment and the like with their foreman. The foremen, however, receive orders from three different functional specialists. This plan, it is apparent, is much simpler from the standpoint of the workmen. But it leaves it

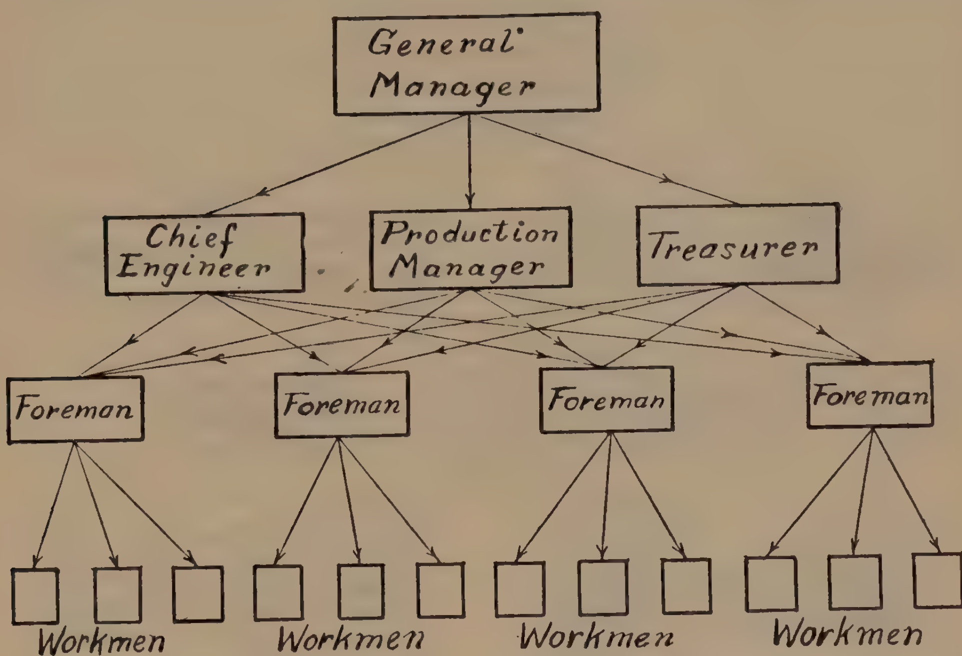


FIG. XLV. An Intermediate Type.

to each foreman to carry out the instructions of his three specialist superiors; and what is more important, to work with these specialists in improving tools, machines, routing, technique and the like. Each foreman must be qualified as a tool specialist, as an instruction specialist, as an order specialist, and as an employment specialist. This is more than can reasonably be expected of all foremen.

A much more usual intermediate arrangement is known as *line-and-staff* organization, illustrated by Figure XLVI. Each workman has but one foreman. The foremen have but three specialists to whom they are responsible. These three specialists, together with the "shipping department," "stock room" and "stores," are responsible in line fashion to the factory superintendent, who is responsible in line fashion along with the power plant and purchasing departments, to the factory manager; and in a certain measure, to the chief engineer. There are a good many functional specialists in this plan of organiza-

tion, but they nearly all report to some general executive higher up, and all their instructions are transmitted downward through these superior officers. Thus only three departments under the factory superintendent have direct access to the shop foremen. The functional specialists constitute the "staff" part of this plan of organization.

Plans of organization also have to adapt themselves to territorial division of activities. Take, for example, a sales company. The tendency will be for such a company to organize more nearly upon the

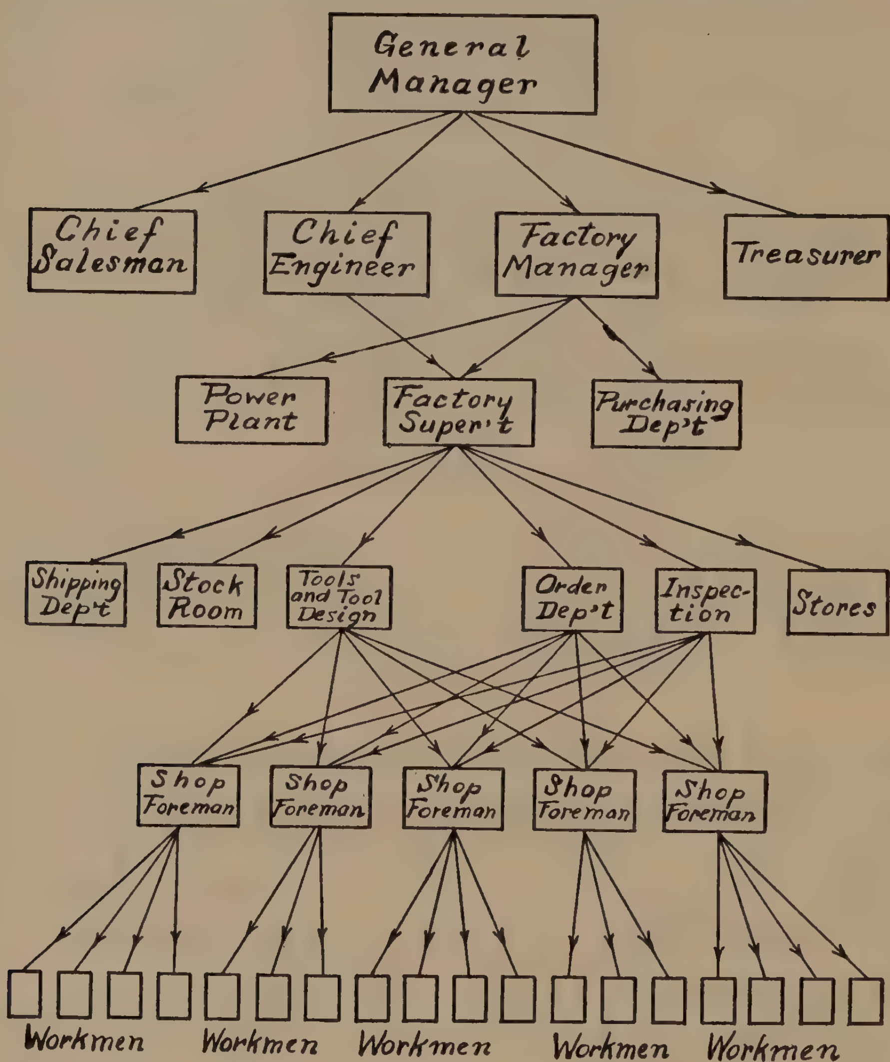


FIG. XLVI. A Type of Line-and Staff Organization.

line than upon a functional basis, although the two plans may be combined in part. Figure XLVII is a plan of such an organization. The actual selling work is organized upon a line basis from the head salesman clear through to the local salesman. These local salesmen each have certain territory which they cover. The general manager is assisted by four functional departments. These four departments

report directly to him, and have no access to the district superintendents or local salesmen except through the general office. If a salesman has a question about the title to a piece of land he is selling, he directs his letter to the head salesman, who refers it to the legal department by way of the general office.

Another type of territorial organization is one involving the operation of plants in different places. Under such circumstances, each plant is likely to have a fairly complete organization of its own, with

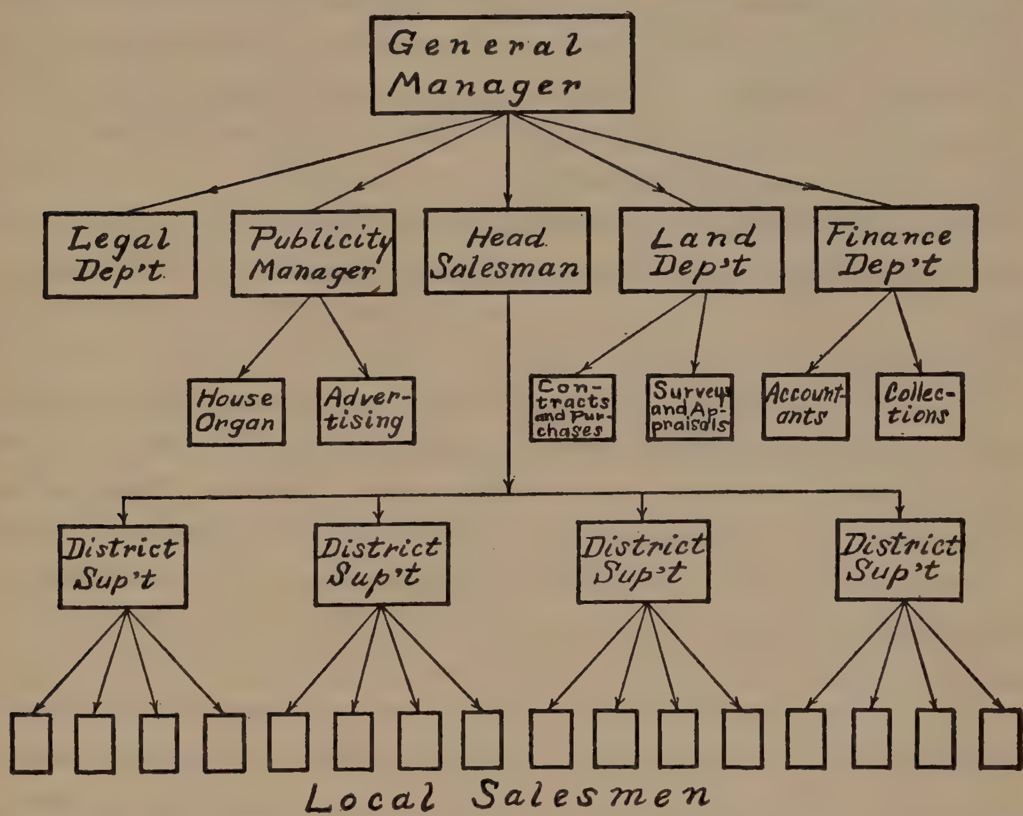


FIG. XLVII. A Plan of Organization of a Land-Selling Organization.

its own functional specialists so far as needed. However, certain of the more specialized or more complicated phases of management may be handled in a functional department representing the whole organization. For example, there may be one legal department for all, or one purchasing department for all.

A chain-store organization, on the other hand, may have a large part of its management functionalized in the general office, its purchasing, its finances, and accounts, its advertising, its personnel problems.

An organization of the territorial type which is built upon a permanent basis and continues with the same activities month after month

can functionalize to much better advantage than one whose work is uncertain and varying. Thus a contracting company which erects dwelling houses can functionalize more than one which takes contracts for large buildings. The company which erects a stadium is probably functionalized in its management only to a moderate degree. This will especially be the case if dispatch is an important factor in the project. In general, functional specialization in management will reduce costs, but it will save time only after a while, after everything has been carefully systematized upon an efficient basis. Line organization may mean higher costs, but it gets quicker results when an enterprise is just getting started. Consequently anyone who takes a contract to do a temporary piece of work in a hurry is sure to organize largely upon the military plan.

Some Difficulties in Organization.—One of the most serious difficulties encountered in organization of enterprises for operation is that of classification upon two or more bases at the same time. Thus a department store may be organized on the basis of type of goods into such departments as clothing, house furnishings, crockery, hardware, etc.; or according to the age and sex of the consumers into children's departments, boys' departments, misses' departments, women's departments, etc. Then there may be a department of goods for special occasions, a bargain basement, and a toy department. When one starts out to buy a boy's tool chest, he may find it in the hardware department, the toy department, or the boys' department. If the customers have difficulties of this sort, one may be sure that the employees do also. It is only in large organizations comprehending a wide field that this difficulty becomes really serious. Shall an organization like the United States Department of Commerce organize its work upon a commodity basis, a territorial basis, or a functional basis? It could have one group of men working with business concerns handling textiles, another group with concerns handling shoes, etc. Or it could have one group working with concerns in the Pacific Coast states, another group with concerns in the South Atlantic states, etc. Or it could have one group working with wholesalers, another group working with exporters, etc. Or it could have one group working with price analysis problems, another with transportation problems. If it is organized entirely upon the commodity basis, then the chances are that men working with all the different commodities will be traveling across the United States to California and to Florida every little while. If organized upon the district basis, on the other hand, it may

be desirable to have a whole group of commodity specialists in each district. The actual organization set up in such case is usually a compromise between various bases of organization, some of the work being arranged on one basis and some upon another. There may be but one statistical division for all, which may act in a service capacity for all the rest. There may be district organizations each with a few of the more important commodity specialists, but depending upon specialists sent out from the central office for most of the commodities.

But all such compromises raise embarrassing questions of jurisdiction and overlapping of interests. These also arise most often in organizations covering a wide field. Within the last year or two, there has been a serious conflict of jurisdiction between the United States Department of Agriculture and the United States Department of Commerce. The Department of Agriculture has generally considered it its duty to follow the movement of farm products at least to the manufacturers if not clear to the consumer. The present Secretary of Commerce is insisting that marketing is "commerce" whether it be of farm products or of anything else. The Department of Agriculture, on the other hand, has insisted that since it is looking after the welfare of the farmers, it must follow their products through the channels of commerce even into foreign markets, and particularly must it concern itself with foreign competition in production.

Conflict of jurisdiction is merely a phase of a larger difficulty in all departmental organization, namely, the difficulty that each department becomes prone to set up its own interests as superior to those of the organization as a whole. The advertising department becomes so interested in expanding its own activities that it fights all the other departments for a larger share in the company's budget. It may even support its demands by wholly unwarranted claims as to credit for increase in sales. The accountants are likely to become so obsessed with what seem to them like accurate costs as to lose all sight of the expense of securing the necessary records. Some departments in our federal government long ago lost sight of the purposes for which they were originally created and now live largely for themselves alone.

Interesting examples of recent issues in organization are the creating of the separate department for enforcing the prohibition amendment, and the fight for the air service as a separate branch of the military department.

The Need for a Strong Executive.—To meet difficulties of this kind, the principal need is for a strong executive. Strength in

an executive does not consist in being arbitrary or autocratic, but in keeping a hand upon all important details, keeping close account of the activities and accomplishments of the several departments, and anticipating all conflicts in jurisdiction—in a word, in understanding the business so thoroughly as to be able to act with a sure firm hand upon all important issues that arise.

SUGGESTIONS FOR FURTHER READING

For further discussion of types of business organization see Russell Robb's *Lectures on Organization* (1910); L. C. Marshall's and L. S. Lyon's *Our Economic Organization* (1921), Chapter XVI; and Alfred Marshall's *Industry and Trade* (1921), Book II, Chapter XI. R. H. Lansburgh discusses type of organization in his *Industrial Management* (1923), Chapters V and VI. D. S. Kimball's *Principles of Industrial Organization* (1919), Chapter VI, contains a treatment of the same subject. Various types of coöperative organization are discussed in *American Coöperation*, a two-volume report of the proceedings of the American Institute of Coöperation (1925). See particularly the papers by F. A. Buechel on *Types of Coöperatives*, Vol. I, p. 78; by H. E. Erdman on *Some Economic Fundamentals of Coöperation*, Vol. I, p. 67; and L. M. Rhodes on *Florida Citrus Organization*, Vol. II, p. 457.

PROBLEMS

1. Discuss the question as to who should make the decision in the following cases,—stockholders, board of directors, executive committee, or president?
   a. Whether or not to buy a new plant.
   b. Changing the selling price of the product.
   c. What price to bid on a contract.
   d. Hiring a general manager.
   e. A strike of the employees.
   f. Buying new equipment.
   g. Closing a sales contract for a carlot of goods.
2. Why does not his one vote per share of stock assure a stockholder of as much democratic control of the affairs of his corporation as does his one vote at election time of the affairs of his city?
3. What type of organization—line, functional, line-and-staff, or modification of these, is best suited for the following types of enterprises? Give reasons in each case.
   a. Feeding 3000 people at a banquet.
   b. Rescuing 100 entombed miners.
   c. A national organization for selling fruits and vegetables on commission.
   d. A large flour mill.
   e. A department store.

f. A storage and transfer business.
g. A chain store.
h. A large wheat farm.
i. A coal mine.

4. Under what conditions is quick action necessary in business administration?
5. Why cannot the constitution and by-laws lay down rules covering all cases?
6. Do the constitution and by-laws protect the small stockholder?
7. Why is it necessary for coöperative organizations to be more solicitous of the opinions and desires of the members than for other corporations?
8. Is this likely to lower the efficiency of the organization? How may this problem be met?
9. Many coöperatives which have hired successful business men as managers have failed. What are some of the reasons?
10. Is partnership management likely to be less efficient than corporation management?
11. Distinguish between lines of authority and lines of responsibility.
12. Complete one of the diagrams in the text by adding to it the stockholders, board of directors and executive committee.
13. Draw a diagram showing the organization of some enterprise or business with which you are familiar (business, club, government, church, etc.).
14. Name the plan upon which it is arranged. Has it an efficient arrangement? Why?

CHAPTER XXI

THE SIZE OF THE BUSINESS UNIT

No more interesting economic phenomenon confronts the student of economics than that of the great variations in the size of the business unit between different industries, between different units in the same industry, and between the same industries in the various parts of the world. Why are manufacturing plants larger than farms? Why are steel manufacturing plants larger than cigar manufacturing plants? Why are sugar refineries larger than cheese factories? Why are some automobile factories so much larger than others? Why in any one locality do farms range in size several hundred per cent; and the same for retail stores and banks? Why in most cities are there generally fewer and larger dry goods stores than grocery stores? Why is the prevailing acreage of farms in some parts of the world over a thousand acres, and in some parts less than twenty-five acres? Why is most of the manufactured product of China turned out from establishments employing less than a score of workers, and most of manufactured product of the United States from establishments employing several hundred workers? Not only are the variations in size at any time of great interest, but also the trends as to size. In most lines of manufacturing in the United States, plants are becoming larger all the time—in some cases very rapidly, in others very slowly. What is the cause of this? Will it continue? How far will it go? Is the usual retail unit too small? Is it increasing in size? Will the farms of the United States eventually be as small as those in Europe? Surely few problems in the field of economics are of more importance than this problem of the size of the business unit. It is the purpose of this chapter to discuss the problem of size in the various fields of production.

I. MEASURES OF SIZE

Before proceeding further with our discussion of size, it will be well to come to a common understanding of the meaning of the term. In popular discussion, size of business is measured in three different ways, namely, in terms of fixed plant, in terms of output, and in terms of

input. Examples of the first practice are the following: farms, measured in acres of land; some factories, measured in terms of the number of "lines" or units of equipment they operate; railroads, measured in mileage of track; some machines or equipment, measured in gauge of intake—a 7-foot grain binder, a 14-inch plow, a 10-row calculating machine; rooms and vessels of all kinds, measured in terms of physical dimensions—a 40-foot freight car, a 20-by-30-foot office. Examples of size measured in output are the following: retail stores, measured in value of sales; some factories and machines, measured in pounds, gallons, barrels, or tons of output; power plants, measured in horse power or kilowatts of power delivered. Examples of size measured in terms of input are the following: some factories, measured in the number of men they employ; some machines, measured in terms of the number of workmen or horses required to operate them; auditoriums, in terms of the number of persons they will seat.

The first question to settle in clearing away the confusion of usage on this point is whether one wishes size of business to mean *volume of output*, or *volume of inputs*, or the *size of the fixed plant*. Two plants may have exactly equal fixed plants, but because one of them is operated to maximum capacity it may have twice the output of the other. One may be operated by a manager with twice the capacity of the other, or with twice the efficiency, and therefore have a larger volume of output. Which of these is the "size of the business unit"? It will be argued by some that size of the fixed plant is not size of the *business*, that size of the manager and of all the other elements of production must be taken into account in the size of the business. They will say that an 80-acre farm with 15 cows is a larger business than an 80-acre farm with 10 cows. They will conclude that volume of output is therefore the best measure of size of business.

But others will point out that although an 80-acre farm very extensively farmed may turn out only a fourth of the product of a similar 80 acres intensively farmed, one of these tracts of land may have as large a *potential output* as the other. They will also point out that volume of output is a very fluctuating thing for many industries, depending upon the weather, the supply of raw material, the state of the market, and the success of the sales department in securing orders. Shall we say that merely because it did not rain in Montana in 1922 that all the farms were very small that year? Efficiency of the elements of production is also a factor in volune of output; do we wish our measure of size to include *efficiency* as well as *capacity?*

The conclusion one comes to after considering all of these contentions is that neither size of the fixed plant nor volume of output really express what we have in mind as size of the business. On the one hand, we want to include in our measure the size of the management and of the other elements as well as of the fixed plant. On the other hand, we do not want to include variations in output due to weather or to other temporary circumstances; nor variations in output due to the fact that some plants are intensively managed and operated and some are not. What we have really in mind as size of the business unit is more nearly the output of the producing unit under normal conditions, and in a suitable combination of the elements. And this takes us back to our discussion of combinations of capacity and efficiency in an earlier chapter. We learned there that the true capacity of each of the elements in the producing unit is measured in terms of its inputs at economic capacity. But what we here wish to measure is the capacity of *all* the elements making up the producing unit—of the variable inputs as well as the fixed inputs, and to measure all of them in one measure. Since all these different inputs are expressed in terms of each other, there is no way of combining them. A perfect measure of size is therefore impossible of attainment.

In practice, several different measures are used which approach the ideal with varying degrees of success. One of these is *value of the fixed plant*. It is argued that although the different plants may be operating at any time at varying degrees of capacity, the prices at which they would sell on the market somewhere nearly reflect their differences in economic capacity. One who buys such a plant reckons in terms of its output under normal conditions rather than in terms of its output at the time. There is much to be said for such a measure. The objection to it is that it does not include the other input elements. In the case of a farm, it does not include the live stock and machinery used. Nor can it be assumed that the fixed and variable inputs vary in proportion to each other. Some very poor land used for truck crops may have large amounts of labor and capital used with it. *Cost of the variable inputs* taken alone is open to this same objection, and the additional one that these inputs reflect whatever combination of elements of production that maintains at the time no matter how far it is from the highest-profit combination. The logical next step is to combine the value of fixed inputs and of variable inputs, all reduced to annual costs. The annual cost of buildings, for example, is their interest, upkeep and depreciation. Such a measure is still

open to the second objection above mentioned. But probably no otherwise suitable measure can be found which will not be. Even if plants were operating at highest-profit combination, we would not know it. *Volume of output at the highest-profit combination*, although not combining the inputs as such of the several elements, does measure the combined effectiveness of all of them. It includes, it is true, the efficiency of the input elements as well as their capacity. But highest-profit combinations, it will be remembered, are combinations of grades of efficiency as well as grades of capacity. A measure of size of the business unit should therefore take account of efficiency. But although volume of output in the highest-profit combination would serve as a measure of size of the business unit, it will not meet the needs of actual use for the same reason that combined value of inputs will not. The difficulty of fluctuating volumes due to weather, markets and the like can be partly met by averaging outputs over a considerable period. But there is no way of meeting the difficulty of the ever-present departures from the highest-profit combination in the matter of the quantity of the variable inputs used, or of their efficiency and capacity. Under actual conditions, therefore, volume of output is a very poor measure of size of the business unit.

The conclusion which one comes to finally is that in actual practice it is impossible to establish any one ideal measure of differences in size. What is actually done is to choose that measure of size of unit for each industry which is workable and at the same time comes nearest to meeting the requirements of an ideal measure. In general, those measures which are in terms of inputs, or which measure the fixed plant in physical terms, really come nearer to being good measures of size than those measured in volume of output.

The United States Census uses all the following measures of size of manufacturing plants: capital invested, rented and borrowed; average number of wage earners employed during the year; wages and salaries paid; cost of materials; primary horse power; total expenses; value of products; value added to the materials by manufacture. The first is a measure in terms of the fixed plant; the next six, in terms of the value of the inputs; and the last two, in terms of output. Various industries and plants within any one industry rank very differently in size according to these several bases; but given all of them, one can explain the deficiencies of almost any of them.

For farms, the following measures of size can be derived from the Census: total acres; improved acres; value of land; value of land and

buildings; total value of farm property. Neither current expenses nor volume of business can be determined except in a very rough way.

Large-Scale Production.—One hears much discussion these days of the tendency towards large-scale production and its advantages and disadvantages. As the term is commonly used, two different but related concepts are involved in it. One of these is that of size of the single operating unit, and the other is that of combination of operating units. The scale of production can be greatly increased by building larger and larger plants, or it can be increased by building more and more plants under one general management. The latter of these methods represents a combination of operating units. The economics of combination of units will be discussed in Chapter XXIX. This chapter deals with single plants under entirely separate management. It will be found that some of the problems of large-scale production are the same for the one large plant as for the several plants in combination; some of them represent the same conditions, but a difference in degree; and some of them are of quite different nature. It is very necessary, therefore, for clearness of thinking, that the two methods of large-scale production should be kept entirely distinct—which, however, is not always easy to do, since under actual conditions the two methods sometimes verge into each other. In some cases small plants are located near together and their operations are so completely related to each other that it is difficult to think of them as separate units. Is a printing plant, located in another part of town from a mail order house, operated solely to print catalogues and price schedules and the like for it, a separate plant or part of the same enterprise? As a business unit expands, it builds another plant at a point convenient to sources of supply for manufacturing some of the parts or supplies used in its product; is this a separate business or part of the same business?

II. FACTORS DETERMINING SIZE OF BUSINESS

In this section of the chapter, an attempt will be made to analyze all the factors determining the size of the business unit, and producing variations in size, as between industries, and countries, and between individual plants in the same industry and country. *For this analysis size will be understood as measured in the ideal way, in terms of either combined inputs or volume of output in the highest-profit combination.* The analysis therefore becomes a study of the factors causing variations in volumes of output in the highest-profit combination.

Capacity of the Management.—It will be at once obvious that the capacity of the management is going to affect greatly the inputs or volume of output that will give the highest-profit combination. Given a manager of limited capacity, anything more than a small input of the other elements, and hence a small output, will mean rising costs per unit of output and presently reduced profits.

The management of an enterprise may be entirely in the hands of one person who devotes all or only part of his time to it; it may be in the hands of a partnership of managers who devote all or part of their

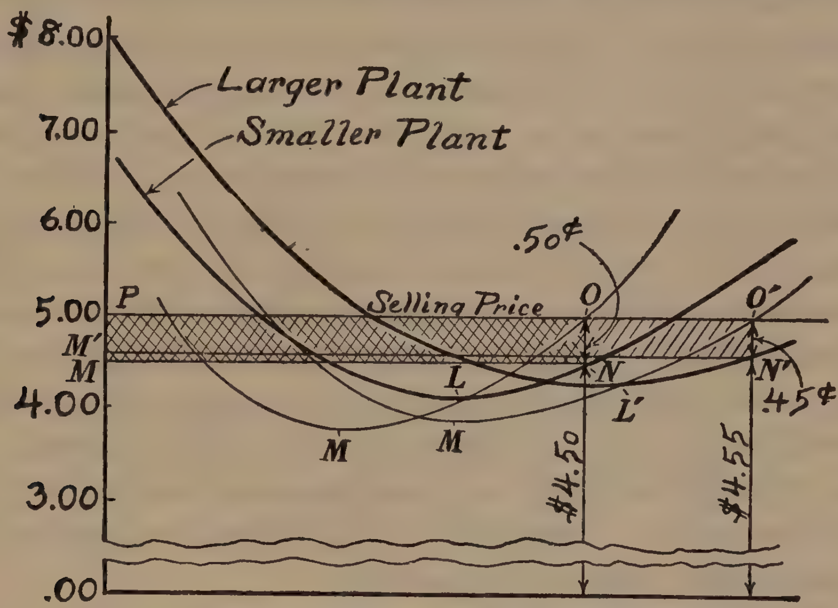


FIG. XLVIII. Highest-Profit Combination with Plants of Two Different Sizes.

Heavy curves—combined costs per unit of output.
Light curves—additional costs per unit of output.

time to it, and divide it between them on various bases; or it may be in the hands of a full corporate body of managers, with a large or small amount of specialization in management, or any degree in between, with whatever degree of delegation of management that must go along with it. The analysis will be started by assuming a one-man management, and this man devoting his full time to management.

Suppose first that this one-man manager undertakes to manage a business with a rather small fixed plant. He will secure the highest possible return for his management at the highest-profit combination, at the point where the profit per unit of output times number of units of output represents the largest possible amount; or expressed in terms of the marginal analysis, at the point where the additional receipts and

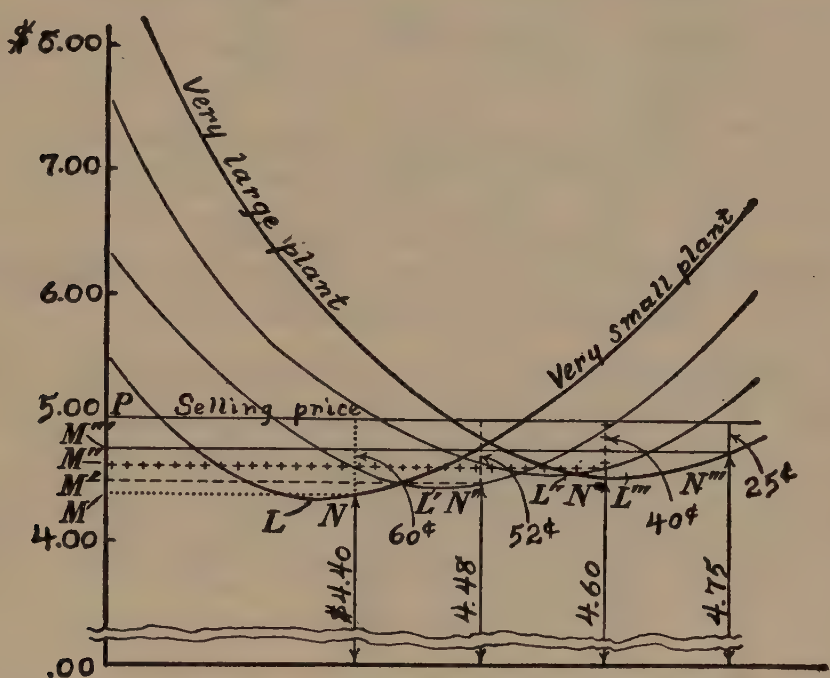
additional expenses are just equal. (See Figures XXII and XXIV.) Rectangle PMNO in Figure XLVIII may be taken to represent the profit with this small plant. For a somewhat larger plant, the rectangle of profit would be PM′N′O. The heavy curves represent combined costs per unit of output, fixed costs plus variable costs, and the light curves the *additional* costs per unit of output. The points L and L′ represent least-cost combination. The manager goes to point N in each case because at this point his profits are greatest even though his unit costs are more. The points O and O′ on the additional curve mark the upper corner of each rectangle, the points where the additional expenses and receipts per unit of additional product are just equal. These two plants are assumed to be identical in all respects except their size. The least cost is lower in the small plant than in the larger plant because the manager is concentrating his attention on a smaller volume of product, thus getting more service out of his workmen, preventing more waste of raw materials, etc. Likewise the cost at the highest-profit combination is lower. But the rectangle PM′N′O is larger than the rectangle PMNO. With the larger plant, the manager has spread his effort over a rather large business and has given less attention to each part of it—to each new order or job, to each workman, to each machine, to each salesman, etc., and costs per unit of output are higher in consequence. But it has paid him thus to spread his effort; by so doing he has increased his profits.

Figure XLIX shows four highest-profit rectangles for four different sizes of plants, all identical except in the matter of size. The largest one is PM″N″O″. The curves of additional costs have been omitted in order to simplify the diagram. The areas of the four rectangles compare in order roughly as follows: 132, 174, 178, 138. This means that this manager would actually reduce his profits by trying to manage the very large business.

Now what is it that determines that this third size of plant will give this particular manager his highest profit? Exactly two things—the capacity of the different plants for management, and the capacity of the manager. In this case, we are assuming the same manager and varying the sizes, or capacities, of the plants. A plant of the third of the above sizes therefore represents the capacity of this manager. Therefore, what we are discovering is the capacity of the manager for plants of this type.

Perhaps this relationship can be shown more clearly if reduced to the usual form of curves for showing capacity of any element of pro-

duction, that of curves of output per unit of input. This is done in Figure L, in which a given manager is assumed to be the fixed element. A still smaller sized plant, indicated as 1a, is introduced at the beginning so as to permit the showing of more of the beginning of the curve. Since it is economic capacity in which we are interested, these curves are in terms of dollars of output per dollar of cost. The points L, L′, L″and L‴represent the outputs per dollar of cost with the four different sizes of plants. The highest output per dollar of cost is with the smallest plant at L. This is because all of the management is concentrated



Inputs of Raw Material—Plants of Four Different Sizes

FIG. XLIX. Size of Plant Giving the Greatest Profit, or Highest Highest-Profit Combination.

upon a small volume of business. The points N, N′, and N‴, represent the highest-profit combinations with each size of plant. The rectangle PM″ N″ O″ shows the highest-profit combination for the third size of plant. Similar rectangles could be drawn for all four sizes of plants. They would be exactly equal in area to the rectangles in Figure XLIX. The third size of plant would give the largest rectangle. The surplus of output over cost at this point is only $.086 ($5.00÷$4.60) as compared with $.136 ($5.00÷$4.40) with the very small plant, but the output is enough larger to more than make up the difference. In the diagram the N points are connected by a dotted line, which may be taken to indicate the highest-profit points for all intervening sizes of plants. Or, if it is desired, one can consider that a

given plant were increasing in size by infinite gradations. The curve of the N's is therefore the regular curve of economic capacity such as was introduced in an earlier chapter. In this case, however, it measures the capacity of management.

The relation between the sizes of these different rectangles in Figures XLIX and L would be more easily seen if the rectangles were drawn

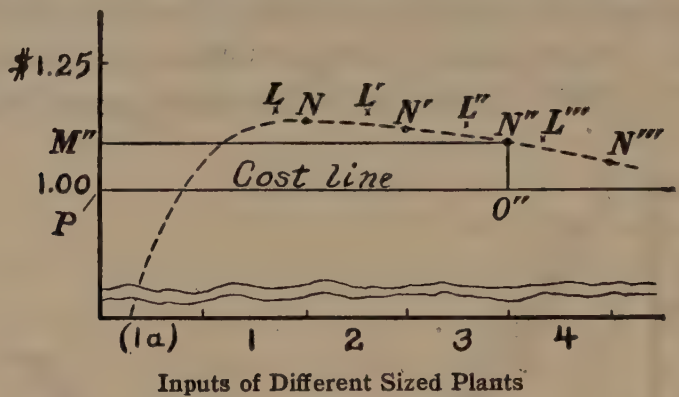


FIG. L. Capacity of Management Measured as Output per Dollar of Cost in the Highest-Profit Combination.

with only one dimension varying. This is done in Figure LI, which also includes the smaller plant and in addition one still larger plant, 4a. The third size is only slightly more profitable than the second.

It has been assumed thus far that the different sized plants are absolutely identical in all particulars except size. This is probably

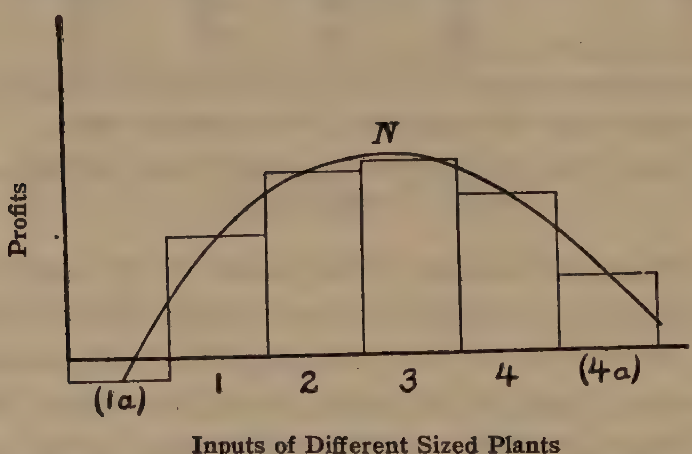


FIG. LI. The Profits Accompanying the Four Different Sized Plants. Shown in Rectangles Drawn With a Common Base.

contrary to the facts in most cases. As a plant increases in size, some parts of the equipment probably do not have to be duplicated, and even the space is likely to be better utilized. The effect of this is to make the unit costs a little lower than they otherwise would be with the larger plants.

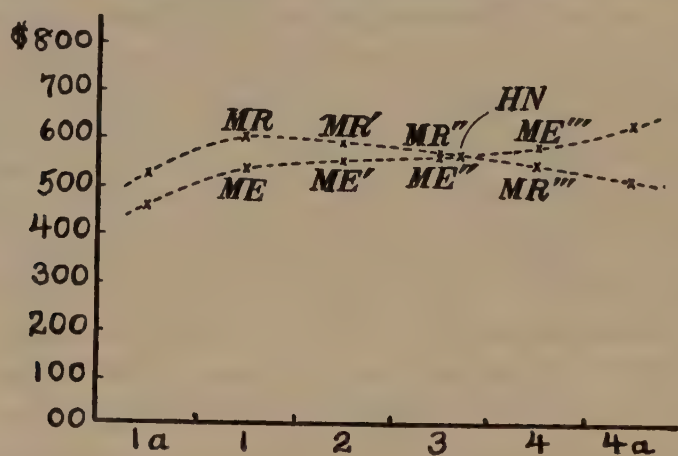
In many ways, and in many situations, the marginal attack on the problem of most profitable size of business is more useful than the one above described. Using this method, instead of working out the highest-profit combination for the various sizes of plants, one will merely consider the probable effect on one's net income of substituting larger or smaller plants for the one now being managed. This will require a balancing either of the additional receipts against the additional expenses, or of the reductions in receipts against the reductions in expenses. The size of business arrived at by such a procedure should be the same as by the method already outlined. As long as additional receipts exceed additional expenditures, the profits must be increased. In Figure LII, this method of analysis is used with the same data as used in Figures XLIX, L, and LI; it shows additional receipts balancing additional expenses with the third size of plant, a little nearer the second than the fourth size. Table XXIII presents the data upon which the table is based. The outputs are larger with the larger plants, but not proportionately larger. For example, the third size of plant produced an output of 110 more than the second size of plant, whereas the 4a size of plant produced an output only 100 more than the fourth size of plant. (These six plants are assumed to increase in size by equal amounts.) The second part of the table shows that balancing additional receipts against additional expenses leads to the same conclusions. Substituting the third for the second size of plant increases receipts by $550, and expenses by $446. It therefore just a little more than pays for itself. Apparently a plant just a little larger than No. 3 size would make an ideal fit. The points in the diagram are connected with dotted lines to indicate what the additional receipts and expenses would be if plants were available in an indefinite number of intervening sizes. This type of diagram is different from the usual diagram of marginal costs and highest-profit combinations only in that its calculations are upon the basis of plants taken as wholes rather than upon the basis of units of output. The point HN is the point of *highest* highest-profit combination for different sizes of plants.

Throughout the analysis thus far in this chapter, it has been assumed that a manager represents a fixed amount of management, and that the amount of managerial effort which he will put forth is the same under any and all circumstances. It was suggested in Chapter XII that this is not the case, and particularly that there is a relation between the return for effort put forth and the amount which any human agent will put forth. As a manager brings more and more

TABLE XXIII. MOST PROFITABLE SIZE OF PLANT DETERMINED BY BALANCING ADDITIONAL RECEIPTS AGAINST ADDITIONAL EXPENSES

Sizes of plants	*Total outputs*	*Total receipts (@$5.00)*	*Costs per unit of output*	*Total expenses*	*Profits*	*Additional receipts*	*Additional expenses*	*Additional net income*
1a	100	$500	$4.45	$445	$55	$500	$445	$55
1	220	1,100	4.40	968	132	600	523	77
2	335	1,675	4.48	1,501	174	575	533	42
3	445	2,250	4.60	2,047	*178*	550	546	4
4	550	2,750	4.75	2,612	138	525	565	—40
4a	650	3,250	4.95	3,217	33	500	605	—105

management to bear on an enterprise, he must exert himself more and more to do it. The first managerial effort comes forth easily; the last, only at great sacrifice of comfort and leisure. What happens, therefore, is that less management is put forth for the very small plant in



Inputs of Plants Increasing in Size by Even Gradations

FIG. LII. Highest Highest-Profit Combination for Different Sizes of Plants Determined by Balancing Additional Receipts against Additional Expenses.

Figure XLIX than for the very large plant. The profit rectangle for the very small plant should therefore be smaller than is indicated in Figure LI; and for the third and fourth sizes of plants, considerably larger than here indicated. But as more management is put forth, its cost will increase also, both because more is put forth, and because it is put forth at greater effort. Figure LIII shows the lines of additional receipts and additional costs of Figure LII adjusted to include these new conditions. It is assumed that a limited amount of managerial effort at the start is put forth at less than no reward. This is probably in

keeping with the facts. When this increasing cost of management is combined with the other costs, and with the new additional receipts curve, the point where additional costs exceed additional receipts comes at HP, considerably sooner than HN. If the point HP were located in Figure LI it would probably come within the second rectangle. The rectangles for the second, third and fourth sizes of plants will all be taller than in Figure LI because more managerial effort is represented in them than was originally assumed; but they will not be enough taller to keep the point HP in the third size of plant.

Which then, is really the point of highest highest-profit combination? Profits really are greatest at HS; but not greater when one takes

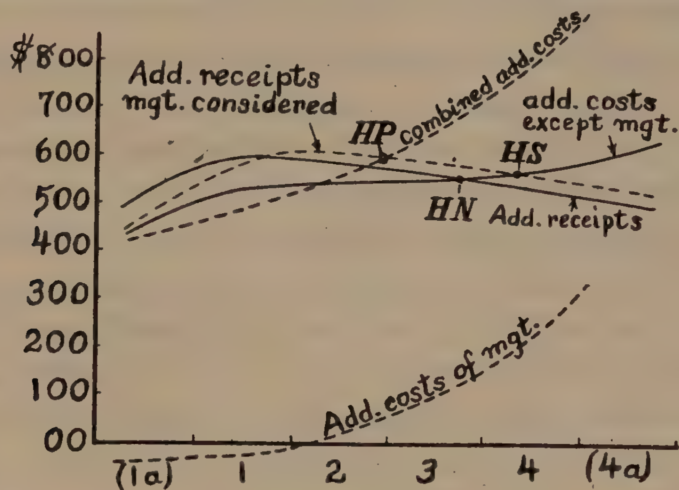


FIG. LIII. Costs of Management Combined With Other Costs.

account of the effort required—not greater per unit of managerial effort. As for profits per unit of management (managerial activity), that is another question. To determine this, one would need to divide the profit rectangle associated with each size of plant by the amount of management applied to it to see which gave the largest quotient. There are probably many managers who could increase this quotient by taking on a larger plant, who will not think enough of the additional profit to be willing to undertake it. There are probably others who think so much of the additional profits of a larger business that they may actually reduce their return per unit of managerial activity by taking it on. Since management is contained in persons, however, it is probably best reckoned in terms of persons, rather than in terms of abstract units of management. On this basis, HP is the proper highest highest-profit combination, and will be so considered henceforth in this analysis.

We are now in a better position to comprehend what is included in the term capacity of management, and to interpret the diagrams in Figures L and LI. The economic capacity of a manager is obviously very complex. If we accept the conclusions stated above, it is measured at point HP. This means that it varies because of three fundamental differences between individuals, which may be stated as follows:

First: *Differences in the physical and mental abilities of individuals.* Given two individuals each putting forth the same effort, one may be able to handle a much larger enterprise than the other. He may have a better mind or physique than the other, or be better trained, or have had more experience.

Next, the capacity of an individual as an entrepreneur or otherwise depends upon his *willingness to put forth effort.* At one extreme are those who are greatly indisposed to put forth any appreciable effort—whom we commonly describe as lazy or slothful. At the other extreme are those who are contented only when they are doing things. Some who are mentally slothful are physically energetic and vice versa.

Thirdly, the capacity of an individual depends upon the value he places upon the rewards for his efforts. Two individuals may be equally lazy or energetic; but one may strive with all his might to get his enterprise on its feet, or to earn money with which to expand it, or to build himself a home, or to provide handsomely for his family; whereas the other has inherited his business, or has no desire to expand it.

These two latter differences are sometimes combined into one statement, namely, differences in *how hard different individuals are willing to strive for a given return.*

The differences between individuals in these two respects are in considerable part national or class differences. A nation of people with a low level of consumption, like the Hindus, will work much harder for a given return than will Americans or Australians. The reason for this is that they have become inured to it through centuries of living close to the margin of subsistence. Increase the reward of such people, and they will respond to it in much larger measure than will the people of the United States—at least, up to a certain point. There are a few who have so little use for the additional income, knowing not how to use it, or who prefer leisure to what they can procure with the additional income, that they stop work when they have earned a subsistence according to their old standards, or work only part of the

time. Persons of this sort are found mostly among semibarbarous peoples recently confronted by civilization.

Peoples with low levels of consumption usually also have low working standards; that is, they are willing to work long hours, at hard and disagreeable work, under hard taskmasters. Bring them into competition with people with higher working standards and they do not change suddenly, but keep up their old working habits. On this basis, they can out-compete those less willing to work hard, and in consequence take their jobs away from them. In the rural districts, they take the land away from the native-born farmers. It is for this reason that California has passed a law prohibiting the Japanese from owning land. In many sections of the United States, the European immigrants of the latter half of the nineteenth century have dispossessed the original holders of the land.

Our interest in this matter in this chapter, however, is from the standpoint of management. While capacity differences between whole peoples, growing principally out of differences in levels of consumption and working standards, are more obvious in the case of labor than in the case of management, they are none the less real in the case of management. Capacity for management is in large part capacity for paying attention to details and keeping them in mind. Entrepreneurs both large and small, but especially small, are more willing to extend their supervision to minute details in the regions with low levels of consumption than in the United States. The differences are especially noticeable in farming, shopkeeping and the hand trades.

Management is such an intangible thing that some economists are disposed to say that it is useless to discuss the question of ratios of management to the other elements, and particularly to speak of capacities of managers. It is true that it is exceedingly difficult, and frequently impossible, to measure management with any degree of statistical exactitude. It is also true that it is an exceedingly variable quantity so far as any one manager is concerned. Yet conceding all this, management does get weighed out and proportioned to the other factors in our various economic processes, and the proportioning is done with sufficient regularity and certainty so that definite tendencies are everywhere manifest. Certain types of businesses regularly require more management than others. The amount of management varies with volume of business with some degree of regularity—not with so much regularity as the amount of labor, but still with enough to make analysis worth while. As businesses increase in volume, the

management presently finds itself overtaxed and begins to neglect important details. If it is a store, perhaps the manager fails to exercise enough care in purchasing and finds himself stocked with a line of goods that he cannot sell. If it is a manufacturing plant, perhaps presently the manager finds sales falling off in certain territory because of a lack of supervision of details in that area; or complaints begin to come in because some of the materials used in manufacturing were not selected carefully enough. Or perhaps the entrepreneur has been looking after all these things carefully enough, but it has been such a drain upon his energies that he is no longer willing to continue it for the sake of the extra profits. For either or both of these reasons, the volume of business is likely to decrease unless some way can be found of adding to the managerial staff.

Let us now consider the case of management and labor combined in one person, as in millions of farms, retail stores and shops the world over. If the laborer-manager divided his time and energy the same between labor and management under any and all conditions, the analysis would not be difficult. We could assume that he was interested in the size of business that would give highest combined profits and wage for his effort, and would go to the point in increasing his business where the surplus of selling price per unit of his output over his expense (not including his own labor) multiplied by the number of units of output, would give him enough additional return to warrant his putting forth the extra effort. But when more of the other elements are engaged in production, and output increases, the laborer-manager devotes a larger proportion of his time to management. The effect of this is to cause him to hire more labor and increase his costs per unit of output, which will have the effect of making the highest-profit combination come earlier than otherwise would be the case. But as the laborer-manager gives more time to management and becomes more of a specialist in it, he is likely to do a better job of it, and the effect of this may more than offset the increasing labor costs. Also at the same time more units of product are being turned out to multiply into the profits per unit and increase the total profits.

Thus combining labor and management in one person has some effects that are good and some that are bad. If they are mostly bad, the tendency is for business units to become larger and engage the full time of a specialist in management. If they are mostly good, other things being the same, the laborer-manager combination persists. The way in which the combination works out varies with industries

and with individuals and individual enterprises. A man who is a skillful manager may easily reduce his other costs per unit of output enough to more than make up the extra labor costs as his business grows and he devotes more and more of his time to management. For a poor manager, the opposite may be the case. This is one of the important reasons why in the same city are found retail stores greatly varying in size; and why in the same locality, widely varying sizes of farms persist.

Any particular laborer-manager can best determine whether it will pay him to expand his business and hire more labor, and the extent to which it will pay him to do this, by observing the effect of

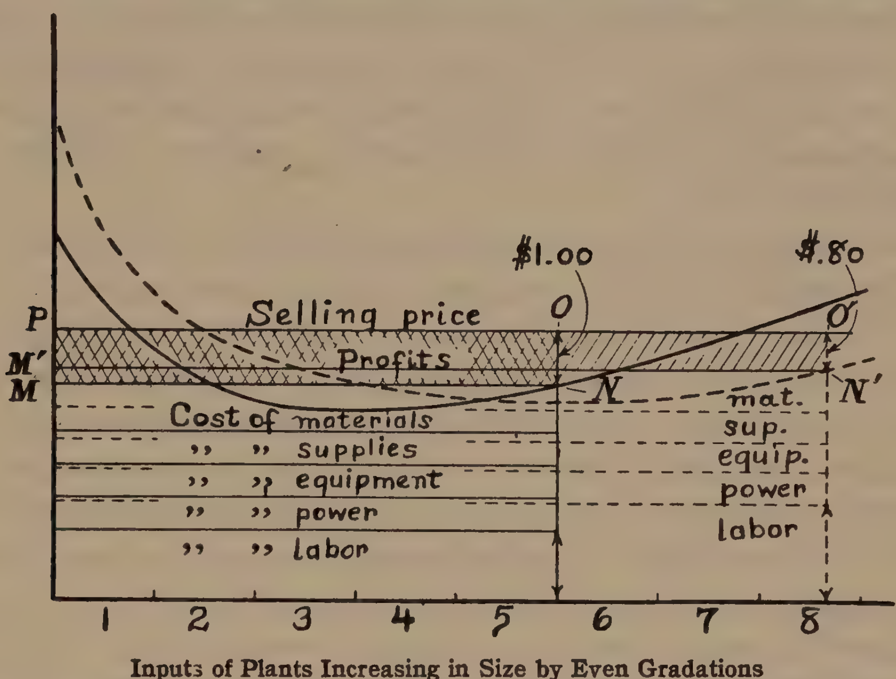


Fig. LIV. The Effect of Hiring Two Different Amounts of Labor Upon a One-Man Laborer-Manager Combination.

each step in this expansion upon his expenses and his receipts. Does it increase his receipts more than his costs? or vice versa? And if the former, is the extra effort sufficiently well paid for in the extra return? In this case, however, an opposite influence frequently manifests itself, namely, that many men prefer management to labor, and will do it for a less return.

A graphic presentation of the relationship may help us to visualize it. Figure LIV shows total costs, at the point of highest-profit combination, divided into separate rectangles for labor, power, equipment, supplies and materials, first with a small amount of extra hired labor, and then with a larger amount of extra hired labor, as larger and

larger plants are considered. The total costs increase from \$5.40 to \$5.60, but the larger output more than makes up for the higher costs. The labor costs actually increase from \$1.40 to \$1.90; but some of the other costs are reduced as a result of more careful supervision.

Delegation of management was discussed in Chapters XIX and XX. When a business becomes larger than one man can manage to advantage, it is frequently advisable to engage some form of an assistant manager. The problem then becomes one of the capacities of the entrepreneur and his assistant taken together. But before we can discuss this problem, we must explain a few circumstances connected with it. One of these is that this assistant manager is probably a *hired manager*, working for a wage the same as the laborers employed by the company. In such a case, two classes of management have to be reckoned with, one which can be called the residual claimant of the net product or profits of the business, and one which has to be included as a cost.

The analysis for delegation of management is much the same as for division of time of a one-man laborer-manager between management and labor. If a business expands and management is hired, then there is a management cost per unit of output to be added to the other costs. It may increase the efficiency of use of the other elements of production enough to more than make up for the management cost; or it may increase the output enough so that the total profit is considerably increased. Sometimes the hired management pays for itself and sometimes it does not. The result will depend in each case upon a number of things, such as the capacity of the manager for directing and supervising an assistant, the adaptability of the enterprise to delegation of management, and the capacity of the enterprise for management.

The method of showing the relationship graphically will be to include an extra rectangle for hired management under the cost-line in Figure LIV. This method of presentation will reveal one of the difficulties with delegation of management in relatively small enterprises, namely, that assistant managers come in relatively large units and cannot be added in small quantities at a time as can land, labor and supplies. Many a business is too small for an additional assistant manager, and too large to get along well without him. What it does under such circumstances is to choose the lesser of two evils. Obviously the larger the business, the less likelihood of a serious misfit of this kind. This is one of the advantages

of large volume of output. Shown graphically, the cost of an assistant manager used with a small output will appear as a relatively short and wide rectangle under the cost-line. This will raise the cost-line so high that there will be little or no profit left for the entrepreneur. With this much management, the other costs per unit of output should be relatively low, but the output will be so small that the total profit will be small. Hence any entrepreneur who turned out a small product while employing an assistant manager would have a small net product left for himself. With a large output, a relatively long and narrow rectangle would be included under the cost-line to represent the cost of the assistant manager. This would mean a relatively low cost-line, leaving a greater net product for himself.

If several assistant managers are employed, then the cost of all of them taken together must be taken as distributed over the other inputs. The more fully this staff of assistant managers is utilized, the less the management cost per unit of the other inputs.

The other important circumstance is that of the differentiation of management that always develops as the managerial staff expands. Even with one assistant manager, the managerial work is differentiated greatly, the entrepreneur always handling the more responsible tasks, or those calling for most judgment. An assistant manager who does certain tasks under the direction of an entrepreneur must be looked upon like any other input associated with the entrepreneur, like man-labor or machine-labor, for example. In the case of man-labor, a certain ratio exists between the amount of labor and the entrepreneur; and also between the amount of labor and the amount of equipment, land and other elements. So with the assistant manager, a ratio exists on the one hand between him and the entrepreneur, and on the other, between him and the amount of labor, equipment and other inputs.

It was pointed out in Chapter XX that management in large enterprises extends down from the president or general manager along lines of authority and responsibility; that there is a sort of tapering down of management from the one central manager to the considerable group of foremen or crew bosses. There is thus set up over the enterprise a sort of pyramid of management, resting on the foreman or crew bosses as the ultimate managerial unit, and culminating in the president or general manager at the top.

This is very evident with the line or military type of organization, but no less true with the functional or staff type of organization, although not so easy to trace. If there are several assistant managers, then a ratio exists between these and the entrepreneur, and between them and the other imputs. These assistant managers are likely to be arranged in ranks, perhaps the first three of them being managers of departments, and the remainder being foremen serving under these department heads. If such is the case, then a ratio exists between the general manager and his three division heads, between each of the foremen and the laborers working under him. A very large business will have more division heads than a smaller one; and the division heads in a very large business will have more foremen working under them than the division heads in a smaller business. If the business, due to abnormal demand for its goods, has a heavy run for a time, even the foremen will have more men working under them. Other things being the same (salaries, etc.), the more managers or laborers of next lower rank any rank of managers supervise, the less the overhead management to be distributed over them—the longer and narrower the cost rectangle. If the business is overmanned with management, the management rectangle may be so high and short that no net product is left for the entrepreneur. If the business is running with a large output, the management rectangle may be so narrow as to leave the entrepreneur a large net product; for the cost of the foremen will be spread over a large number of workmen, and likewise the cost of the department heads, unless their number is increased. But the volume of business can easily be increased to the point where the additional outputs will not pay for the additional inputs of elements other than management, or at least not return enough over their cost to induce the entrepreneurs to make the necessary exertion except for short periods.

If a business is poorly organized, it may be oversupplied with management of one rank, say foremen, and undersupplied with management of another rank, say, division heads; or vice versa. The effect of this is to increase the management cost per unit of the other inputs, and leave less net product for the entrepreneurs. The general trend to-day is toward a more functional type of organization; and functional organization generally requires more management. At the same time, however, it finds new and frequently profitable things for management to do, so that the

output per unit of labor, equipment and other inputs may be increased more than enough to pay for the extra management.

We can now see more clearly the whole relation of delegation of management to size of business. If management could be clearly differentiated, and then delegated successively to lower and lower ranks of managers, there would be scarcely no limit to the size which an enterprise could attain. All the steel manufacturing in the United States could be under one management; and all the railroads. There would have to be different plants, and different railway lines; but all could be managed ultimately from one central office. More than this, all the manufacturing plants of all kinds in the United States could be managed as one complete system. The principal reason that this does not happen is that there are always serious difficulties in the way of delegating management. These difficulties are more serious in some lines of production than others. But no matter how simple the operations, or how machine-made the product, ultimately a point is reached where the details of the operations are so far removed from the master mind of the enterprise that it cannot know sufficiently well what is going on. Many of the difficulties encountered have already been suggested. The larger the business the more elaborate the system for giving instructions and getting orders carried out; and also the system of records and reports. Some businesses require more of this than others. Think of the supervision necessary in a department store, and the elaborate system required for checking cash receipts from customers. Contrast this with a large factory turning out one product and using machinery for nearly every operation. Some businesses have in themselves certain elements that make delegation of management successful. This is probably true of railway and telephone and telegraph businesses. In general, those businesses which are most subject to variations, like farming, lend themselves least to delegation of management.

One of the places where delegation of management breaks down is in the selection of assistant managers. Some entrepreneurs or general managers are excellent judges of men and owe their success more to this than to any other one thing. Others succeed because of the excellent systems they devise for keeping check on less competent assistants.

It is in connection with delegation of management, however, that large enterprises have some of their important advantages

over small ones. Large businesses are more likely to secure good fits of capacities of management than are small ones. Large businesses permit more differentiation of management than do small ones. Thus the grade and type of management can be better suited to the particular management tasks to be performed; and also in many cases a lower grade of management can be used for many of the lesser management tasks. In a small business, the one manager, who has to be a fairly high-priced man if he is to handle the major problems of the business satisfactorily, also has to do a good deal of supervising of men and handling of complaints that is done by lower-priced foremen in larger businesses. If tasks of this kind can be performed with lower-priced management, higher salaries can be paid for the top rank of managers. The company can then go out and bid for the best management that can be found for its head positions.

It is now apparent that the same principles of combination apply to management as to the other elements of production—the principle of diminishing physical outputs, the principle of decreasing and increasing economic inputs or costs, and the principle of the combination of capacities. Why then not calculate a least-cost combination with management as one of the input elements? Obviously the more the capacity of the management, the more of the other elements that can be associated with it to best advantage; and hence the farther to the right the least-cost combination; hence the larger the enterprise. Would not the point so determined be the highest-profit combination? The answer is that it would be. Figure LV represents what such an analysis would be like. Management is assumed to be the fixed element, and different sizes of fixed plant are added. It is assumed for the sake of simplicity that all other costs are proportional to size of fixed plant. One of the curves shows inputs of fixed plant decreasing to a point A and then increasing; and the other shows inputs of management decreasing to T and then increasing. If both plant and management must be paid for, then the least-cost point will be somewhere between A and T, depending upon the relative prices of each.

But how much is to be taken as a cost-rate for management? If the manager were to offer his services for sale, he might find out what they were worth to somebody else; and he might take this as a measure of what he ought to receive working for himself. This is what is actually done in many similar situations. If the oper-

ator could make an estimate on the foregoing basis or some other as to what his services are worth, he could with this as a cost-rate determine his least-cost combination with land. Figuring in this way, he might find his least-cost combination located at L or L′ or L″, depending upon the estimate he placed upon his services. If he put a high estimate upon his services, the least-cost point would be nearer T; if a low rate, it would be nearer A—rates for plant remaining the same.

Suppose the manager assumed too high a cost-rate for himself? The product of output per unit of plant times number of units of plant increases all the way to T. This means that it increases beyond the point of least-cost combination. If he made his cost-rates for his management very high the manager would find the

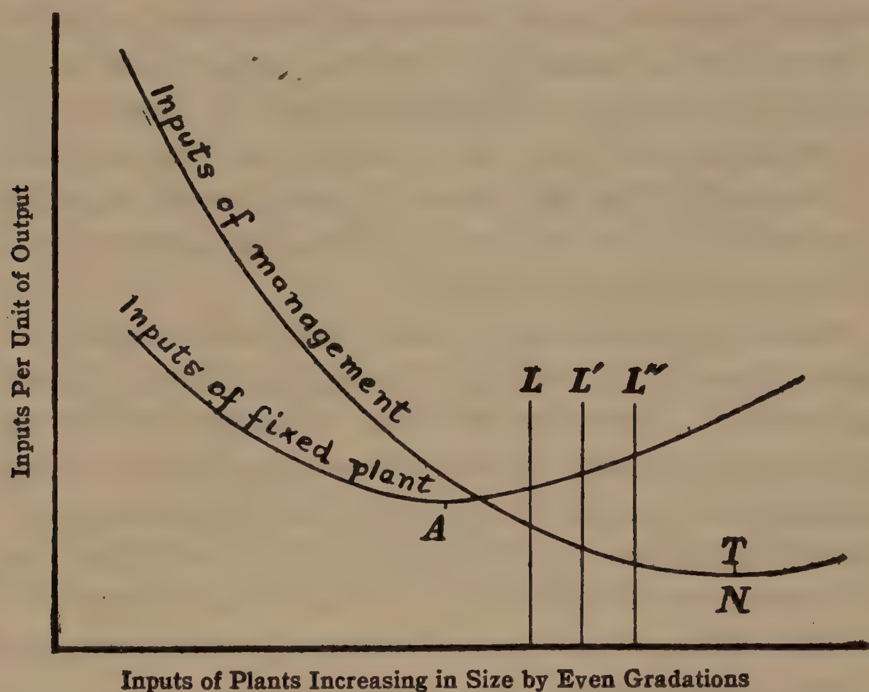


FIG. LV. Least-Cost Combination with Management Included as a Cost Element.

least-cost combination moving near to T. But at the same time he would be reducing his profits, for while he was increasing his output per unit of his management, he would be increasing his cost of plant per unit of output, and beyond the point of least-cost combination, this would more than offset the increase in output per unit of management, or conversely stated, the decrease in management per unit of output. This would be equivalent in the other analysis to going to a point where the profit rectangles become smaller. If too low a cost-rate were assumed, the opposite

effect would be produced. Hence it is necessary that an accurate cost-rate be assumed. And obviously this is impossible. The nearest that most managers can come to the value of their services is to say that they are worth what they can make them earn operating an enterprise—that is, what profits they can make. If a cost-rate could be estimated that would give a least-cost combination at HP in Figure LIII, the two methods would give the same results. But HP is the very thing which it is desired to determine.

Hence the only attack on the problem which is of use in solving it is to increase the size of the plant until the total profits begin to decrease, or increase less than enough to reward one for the extra effort involved in managing the larger plant. Practically speaking, this means, as we have seen, watching the additional expenses and the additional receipts to see which are the greater. Out of this a rule of procedure is sometimes derived, which runs as follows: *The manager (entrepreneur) should add units of plant or other elements of production to himself to the point where the last unit added just pays for itself.* The rule should be understood to include pay for the extra discomfort involved in managing more units, as well as for the extra out-of-pocket outlays.

This method of attack can be used if the problem is one of taking on assistant managers as well as if it involves taking on more plant or labor or land. Does the assistant manager add to the gross receipts enough to meet the extra costs involved in employing him, including the trouble of directing and supervising him? Just how much managerial assistance will cause additional receipts exactly to meet additional costs? It can even be applied to the question of whether or not to substitute a purely functional for a line-and-staff organization.

In this section of the chapter, we have endeavored to show that the size of the business unit depends upon the capacity of the management. The greater the capacity of the management, other things being the same, the larger will be the business unit. A business can be no larger to advantage than can be handled to advantage by the management which is in charge of it. Of course it could also be said that a business can be no larger to advantage than its labor force can handle. But the labor force can usually be expanded or contracted at will, whereas management is usually a definitely limiting factor. Except in the case of the larger corporations, the business, at least in its inception, is usually built around

a certain definite entrepreneur or group of entrepreneurs. The managerial capacity of this group limits the size of the business. The analysis of the relation of capacity of management to size of business follows the same lines as the analysis of proportions of other elements of production. It can be made in terms of the least-cost combination of management and the other factors, but a better procedure is that presented in Figure LIII, in which the additional costs of the other elements are balanced against the additional receipts.

Efficiency of Management.—Managers of course vary in economic efficiency as well as in economic capacity. The curve of outputs per dollar of costs in Figure L shows the economic efficiency

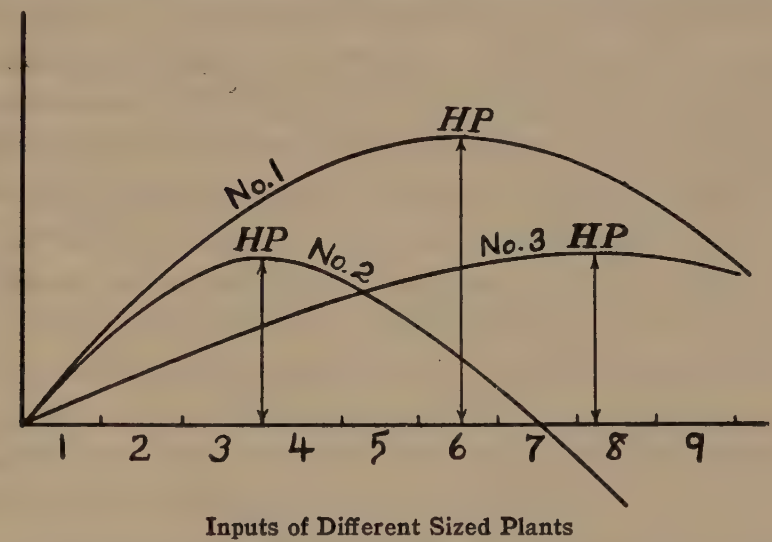


FIG. LVI. Comparative Economic Efficiencies of Three Managers for Plants of a Given Type.

of the manager in question at the various inputs of plants. Maximum economic efficiency is measured at point HP of highest-profit combination. Figure LVI compares the economic efficiency of three managers. Manager No. 1 is more efficient in the handling of the particular plants in question at all inputs shown in the diagram. Managers No. 2 and No. 3 are equally efficient at their points of maximum economic efficiency, that is, at their highest-profit combinations; but No. 3 has much more capacity for plants of this type than has No. 1. These same differences could be shown using curves of inputs per unit of output and rectangles of profit as in Figure XLIX.

It is easy to see from these diagrams how differences in efficiency of the managers will affect the size of the business. The

more efficient the manager, the narrower the cost rectangles and the wider the profit rectangle. The more efficient the management with which other production elements are associated, the larger the rectangles of maximum profits; therefore, other things being the same, the more of the other elements that will be added before the rectangles will begin to diminish, and before the additional expenses, plus the additional cost of effort, will exceed additional receipts. Efficiency of management therefore tends to increase the size of the business. This does not mean, however, that all business handled by efficient entrepreneurs will necessarily be large. Many efficient entrepreneurs will be relatively low in capacity. They may be low in capacity for any of the reasons mentioned, such as a limited amount of energy, unwillingness to work, or a low appreciation of income. But all these things being equal, the more efficient entrepreneurs will tend to manage larger businesses.

The Capacity of the Other Elements of Production for Management.—If size of business is measured in inputs, then obviously the larger the units of input, the fewer the inputs that will be designated as the size of the business. Thus the size of a milling business in bushels would be less measured in 60-lb. bushels of wheat than in 56-lb. bushels of wheat. But these are not real differences in size, but only in the size of the unit in which size is measured. The differences that are contemplated in this section are more fundamental than this. They have to do with the different capacities of the other elements of production for management. Skilled labor probably has a different capacity for management than unskilled labor; and unskilled labor than mule labor; and mule labor than machine labor; and machine labor than hand. The more management that any element of production will absorb at maximum efficiency, the less of that element which will constitute its capacity, and the smaller will be the business in terms of this input.

To determine the economic capacity of any element of production for management, one would hold this element fixed and associate increasing amounts of management with it until the point of maximum economic efficiency was reached.

In general, machine production requires less management per unit of output than does hand labor. This is one of the reasons that production is increasingly upon a larger scale. As long as most of the work is done by hand, each worker has to be super-

vised carefully. Machine products are uniform and standardized, and cannot very well be otherwise, so that far less supervision is required.

Labor that is concentrated under one roof is easier to supervise than labor that is spread over a large territory, like railway labor, or mining labor, or farm labor. Labor that works at the same task day after day and year after year, as in factories, is easier to supervise than labor that shifts freely from one task to another, as upon many construction jobs, or upon farms, or in stores. Labor that works at operations that are subject to sudden changes, such as those which are dependent upon the weather, needs much more supervision than labor that works indoors. Labor that works upon raw materials that are not standardized, such as much of the raw materials of agriculture—for example, wheat ready for milling, live stock ready for slaughtering, fruit ready for canning, logs ready for sawing—needs much more supervision than labor that works with more uniform materials, such as yarns ready for weaving, pig iron ready for molding. Labor employed at caring for live stock on the farm is an extreme example of labor working with unstandardized material. To secure maximum physical efficiency, each individual animal in a herd needs to be fed its own particular ration; likewise, for that matter, each acre of land on many farms. The most unstandardized of all materials worked with are the human beings dealt with in merchandising and other similar production processes. Consequently sales organizations generally are well provided with supervision of various kinds.

In the last analysis, it is mostly labor that is supervised; but not altogether. The manager must inspect his plant, equipment and materials before he can direct the workmen in their use of them. The more equipment each worker uses, the more supervision required per man. The more land over which each worker spreads his activities, the more supervision per man. Consequently, it is proper to say that all the elements of production are consumers of management. Each of the production elements consumes management at its own rate. The proportion of the different production elements will therefore affect the rate at which management is consumed. Perhaps it is simpler to say that each element of production has its own "complement" of management. This can be illustrated in Figure LVII, in which the cost rectangle is split between land, labor, and capital, and also the profit rectangle.

The point HP is the point of the highest highest-profit combination, at which additional costs, including the increasing cost of putting forth more managerial activity, exactly equals the additional receipts. The management rectangle is split into a small rectangle for land, a still smaller one for equipment, and a larger one for labor. The rectangles are drawn this way on the assumption that labor requires a larger complement of management than either land or equipment, and that land requires a larger complement of management than equipment. These rectangles cannot be looked upon as *costs* of management in the same sense that the

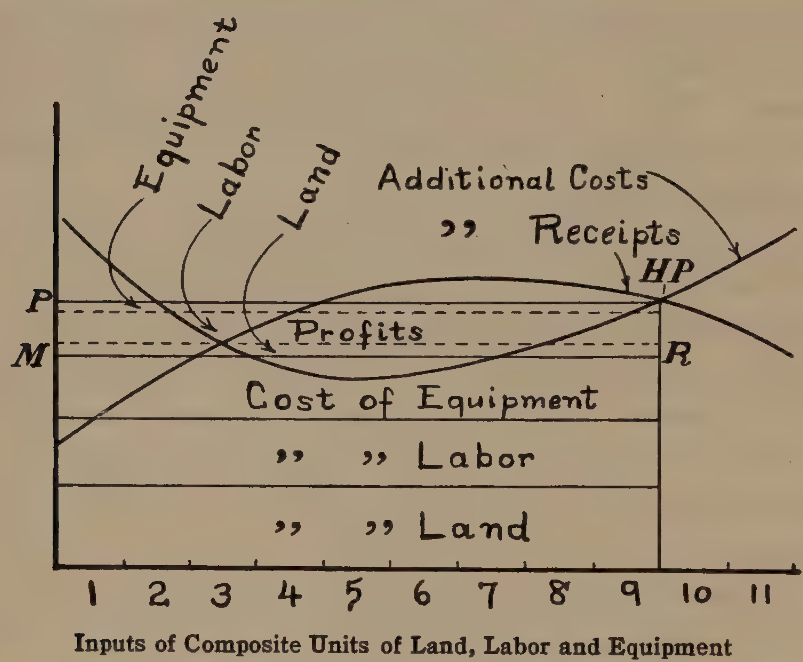


FIG. LVII. Relation of the Capacity of the Elements of Production for Management to the Size of the Business Unit.

lower rectangles are costs of land, labor and equipment. Yet they are costs in the sense that if equivalent additional receipts do not follow, the management will not be forthcoming. If, for example, the management complement for equipment were twice what it is, unless the additional receipts were equally larger, the entrepreneur would stop adding composite units sooner, say with the eighth input instead of the ninth. Or if labor required a smaller complement of management, the entrepreneur would go beyond HP in adding composite units.

The complement of management required by any element, or in other words, the capacity of any element for management, therefore determines how many units of the element will be associated

with an entrepreneur or group of entrepreneurs; and hence becomes a factor in determining the size of the business. Where several elements are together associated with entrepreneurship, it is the combined capacity of the several that must be considered.

One reason will now be apparent for the prevailingly small size of farm and store and hand-trade enterprises. In all of these, labor is employed under conditions that give it a large capacity for management. Even the materials worked with are of such nature that labor employed upon them requires close supervision.

There has been much discussion at times in this country and abroad as to the proper size of farms, particularly in its relation to intensity of cultivation in agriculture. Some have said that the farm entrepreneur should add the other elements of production to himself to the point where the last unit just pays for itself; some to the point of highest output per dollar of cost; some to the highest output per "composite unit of labor and capital." The first of these statements is correct if it is understood so as to take account of management and particularly of the different complements of management required by the different elements of production. The second statement does not take account of the difference between highest-profit and least-cost combination nor of the complements of management for the different elements. The third statement neglects the complement of management that goes with land. It is surely true that a given amount of labor and capital requires more management if spread over a thousand acres of land than if spread over only a hundred. Furthermore, this method provides no practical way of application except to combine the various forms of labor and capital on an annual cost basis, and this obscures the difference between their complements of management. The analysis presented in this chapter and Chapter XII takes care of all aspects of the problem. The most practical application of it is in terms of the marginal analysis.

Intensity of cultivation is commonly understood to mean the ratio of labor, capital, and other elements of production to land. If a farmer is free to increase or decrease his acreage of land the same as his amounts of the other production elements, the foregoing analysis fully takes care of the problem. Land will be added or taken away just like any other element whenever the size of the profit rectangle is increased by so doing. If the farm entrepreneur has a fixed acreage of land which he is operating, then the

only way to increase the size of his business is to increase the intensity of cultivation of the land; and ipso facto, it will not be possible to increase his intensity of cultivation without changing the size of his business. The analysis under such circumstances must consider land as a fixed input along with management. It differs from management in that its capacity is fixed for any other production element of a given type and grade, whereas the capacity of management is a variable quantity.

The Efficiency of the Other Elements of Production.—The output from any combination of elements of production depends upon the efficiency of all of the elements. The more efficient the labor with which a given grade of management is associated, the larger the output per unit of management; and likewise the larger the additional outputs; and hence the larger the business, since the entrepreneur will in consequence take on more units of input. This is simply another way of saying that an entrepreneur will extend himself more to take on efficient units of labor or equipment or land or live stock than he will to take on inefficient units of the same. This statement needs no demonstration. In this connection, one must distinguish carefully between capacity and efficiency. The units may owe their superior productivity to capacity rather than to efficiency; and this capacity may be capacity for management as well as for labor, fertilizer and other elements. As has already been noted, the greater the capacity for management, the fewer the units that will be managed.

The Combination of Capacities of the Other Elements of Production.—As already pointed out, in order to secure a relatively low least-cost combination, the elements of production need to be combined in such a way as to secure most advantageous utilization of each. A small print shop cannot utilize a lineotype machine to best advantage; or a small creamery a milk-powder machine. The possibility of reducing costs by enlarging output therefore becomes an incentive for reducing costs, and once costs have been reduced in this way, the particular plants benefiting from it are in a better position to outbid their competitors and reduce costs still further.

It is sometimes said that all manufacturing enterprises are able to reduce their costs by increasing their volume of business. As we will see later, this is not always true. But in general, the larger the volume of business, the more fully plant and equipment are

utilized, and the less likelihood of misfits between the elements of production. A volume of business too much for one machine, but not enough for two, represents a higher percentage of misfit than one which is too large for ten machines, but not enough for eleven. Larger businesses also generally use large machines, and larger machines are generally more economical of labor, power and space than smaller machines. Larger buildings can also be better arranged, and can provide space more cheaply than small buildings.

Many manufacturing establishments are organized on the basis of units of equipment. A flour mill, for example, has a certain number of grinding machines, each with its own set of accessory machines. A similar arrangement is found in ore-dressing mills and canning factories of all kinds. Some parts of the equipment may serve two or three lines; for instance, a rock-crusher may break rock for two lines of separators; or several of some types of machines may be used on one line. Under such circumstances, the tendency is to build a plant just large enough to accommodate a certain number of lines.

A farm business is peculiarly subject to misfits of capacities. It is likely to be either too large or too small for several of the elements of production. The ordinary farm is too small to utilize most of its equipment to advantage. Many farms are too large for one team or one man, but not large enough for two. So important is this that there is a pronounced tendency for farms to range around one-man, and two-man, and one-team, and two-team sizes.

Whenever one of the elements of production is fixed in size or amount for the time being, as is often the case with factory buildings, this becomes an important influence in determining size of business. As the output from the plant increases, building costs per unit of output constantly decrease; but other costs presently increase because the building becomes too crowded. This can be represented graphically by representing building costs as a rectangle set above the rectangle for equipment in Figure LVII. The area of the rectangle for building costs will remain constant instead of changing with each input as with the other elements, being short and wide at three inputs of land, labor and equipment, and long and narrow at nine inputs of the other elements. As one goes toward HP, the cost-line will be lowered and thus the net

product increased. This will continue until the overcrowding of the building begins to lower the additional product line.

At any given time, a large part of the productive capacity of a country is tied up definitely in plants of fixed sizes with fixed equipment. This puts a check upon changes in the size of business units. Usually one cannot afford to demolish a plant in order to obtain one of the proper size. Neither can one always afford to sell out and buy a larger plant, although there is much of this latter always going on, especially in agriculture and merchandising. As a result there is always a great deal of misfit of capacities.

The Price of the Product.—The higher the price of the product, the greater the value of the additional outputs; hence, other things being the same, the more inputs that will be used, and the larger the volume of business; or, expressed in terms of rectangles, the larger will be the profit per unit to multiply into the number of units. In Chapter XII, the effect of price upon the highest-profit combination was illustrated by an example of a shoe factory. Table XXIV is a similar illustration in terms of a flour mill. Turning out 800 barrels of flour per day at a cost of $5.50 per barrel, the mill will make a profit of $400 if the selling price is $6.00 per barrel, $800 if the selling price is $6.50 per barrel; and $1200 if the selling price is $7.00 per barrel. The least-cost combination is attained with an output of 1000 barrels per day. When the selling price of flour is $6.00 per barrel, leaving a profit of $.70 a barrel, the mill makes the largest profit at this output, for at this output the profit per barrel times the number of barrels gives the largest multiplication product. But at $6.50 per barrel, the mill makes the largest total profit with an output of 1100 barrels per day; and at $7.00 per barrel, it makes the largest total profit with an output of 1300 to 1400 barrels per day. Thus the highest-profit combination and hence the volume of output shifts with the selling price of the product. Under the stimulus of higher prices, the management increases its output, even though its costs rise due to a less efficient use of plant, equipment and labor.

This is in keeping with common observation. Whenever prices rise, entrepreneurs try to increase their output. They do this by increasing the input of raw materials, labor, or other elements. If some one factor is fixed, for example, the plant, they will use more labor in the same plant, or perhaps work more hours per day. In the case of agriculture, the entrepreneur usually undertakes

first of all to obtain more land, and if he is unable to do this, then he applies more labor and capital to the same land.

TABLE XXIV. EFFECT OF CHANGES IN PRICE OF FLOUR UPON THE VOLUME OF OUTPUT OF A FLOUR MILL

Output—barrels	*Costs per barrel*	SELLING AT $6.00 PER BARREL		SELLING AT $6.50 PER BARREL		SELLING AT $7.00 PER BARREL	
		Profits per barrel	*Total profits*	*Profits per barrel*	*Total profits*	*Profits per barrel*	*Total profits*
800	5.50	$.50	$400	1.00	$800	$1.50	1200
900	5.40	.60	540	1.10	990	1.60	1440
1000	5.30	.70	*700*	1.20	1200	1.70	1700
1100	5.40	.60	660	1.10	*1210*	1.60	1760
1200	5.50	.50	600	1.00	1200	1.50	1800
1300	5.60	.40	520	.90	1170	1.40	*1820*
1400	5.70	.30	420	.80	1120	1.30	*1820*
1500	5.80	.20	300	.70	1050	1.20	1800

It is doubtful, however, if the entrepreneurs of the flour mill would push production clear to 1300 or 1400 barrels per day even with a profit of $1820 to reward them. At some point this side of this output, the extra profit would hardly repay the extra effort required. Or it might for a short period, but not as a regular thing. In the illustration, the increases in selling prices and total profits have been exaggerated in order to bring out the effects. In actual production operations, selling prices of flour would seldom rise so far above costs.

The relation between selling prices and profits and volume of business is a very important one in the business world. At certain periods, the demand for many goods rises more rapidly than factories can be built to produce them. In such a situation, the price rises sharply and hence profits per unit of output, and this stimulates production from factories already in operation. Presently, however, new factories are constructed and prices decline and profits fall off, and output per factory falls back to normal, or probably below normal for a while.

When a new enterprise is started, it must be designed to handle a certain volume of business at highest profit to the entrepreneurs. Such a calculation cannot be made, however, without assuming certain prices for the product. The best that can be done is to forecast the average price over a period.

Prices of the Other Elements of Production.—Any rise in the prices that must be paid for the elements of production—for the plants in Figure XLIX, or for labor, power, supplies, material and equipment in Figure LVII—will of course raise the cost-line without raising the product line, and hence will reduce the net product, and hence reduce the volume of output—this assuming that the price of the product remains the same. A fall in the prices of the cost-elements will have the opposite effect. A change in the price of even one cost-element will have this effect, providing it is not offset by an opposite change in the price of some other cost-element.

Changes in prices of cost-elements are as common as changes in the prices of products. They constitute, therefore, an important reason for changes in volume of business. The business as a whole must be organized on a fairly definite basis, and cannot entirely readjust itself every time prices of the cost-elements change; but some readjustments, especially as to volume of output, are always possible.

In general, the prices of cost-elements rise and fall along with the prices of the product. Most of the sweeping changes in prices are changes in the general price level and affect the prices of all things more or less alike. If the prices of cost-elements and products rise or fall together and in equal proportion, no change in volume of business is called for. But if one rises or falls more than the other, then a change is needed. There are many instances of this very thing, occasionally in industry in general, more frequently in particular industries. Just at present, wages of labor are relatively high. From 1900 to 1920, the rents of land rose more than the prices of other cost-elements. A more frequent type of maladjustment is due to lags in prices of some of the cost-elements, or in prices of the product. For example, from 1916 to 1919, wages and rents rose less rapidly than prices of the product; and from 1920 to the present, they have fallen less rapidly than prices. Inasmuch as these maladjustments are more or less temporary, it is not always advisable to readjust volume of business to meet them.

Changing prices of the cost-elements bring out some interesting relationships between the least-cost and highest-profit combinations. An equal rise in the price of all cost-elements does not shift the least-cost point; but it does shift the highest-profit point, because it raises the cost and lowers the profit per unit at the highest-profit point. A rise in the price of some of the cost-elements, but

not in the others, shifts the least-cost combination, and in most cases also the highest-profit combination.

The Quantity of Product which the Market will Take, and Competition.—A factory can have no object in manufacturing more of a product than it can sell. At any particular time, there is a certain number of factories making a given product, and these factories have a certain combined capacity, which is usually more than the market will absorb under normal conditions. In periods of prosperity, the market may be better, and the factories can run under heavier loads; but these periods will be offset by others when factories will have to run with light shifts. Hence at any one time, the output of all plants is definitely limited by the state of the market.

Any one particular plant may expand its sales at the expense of its competitors. But there are usually fairly definite limits to this. Many manufacturing enterprises have a certain territory within which, because of shorter hauls and lower transportation costs for raw materials and products, they are at an advantage over their competitors; and outside of which they are at a disadvantage. It is also a very unusual firm that can so conduct its affairs as to please everybody in its own territory. In consequence, unless the territory is very small, it will have at least one rival in its own territory, and frequently it will have several, and although it may take some business away from these, it seldom can carry this to a point of putting all of the others out of the running.

This latter process is seen working out to the fullest extent in retail merchandising. There probably are a dozen reasons why the small grocery and meat shops persist, but not least among them is the fact that one firm is seldom able to satisfy all potential customers within its territory. But it also works out in the case of many lines of manufacturing, for example, flour, breakfast foods, shoes, clothing, etc.

The Quantity of Raw Materials Available, and Competition.—Plants whose function it is to work up raw materials into finished products, like creameries, canning factories, flour mills, meat packing plants, sawmills, etc., have their size definitely limited by the supply of raw materials within reach. To be sure, volume of business can be expanded by hauling from farther and farther distances, but the extra hauling costs soon offset all gains from having a larger volume of business to handle. This gives another plant a chance to start at some point adjoining, and then there are two to

divide the intermediate territory. It may be that these two are far enough apart so that each has about all the business it can handle to any important advantage, but more likely each will take some desirable business away from the other. This is illustrated by Table XXV, which shows creamery manufacturing costs and hauling costs separately and combined. The manufacturing costs range from 7.14 cents per pound for a creamery making 50,000 pounds a year, to 3.00 cents per pound for a creamery making 600,000 pounds per year. The hauling costs in an area producing annually 1000 pounds of butter per square mile average 1.15 cents per pound for a creamery making 50,000 pounds of butter annually. Thus manufacturing costs are less with larger plants, but hauling costs are more. At 250,000 pounds per creamery, the two costs combined are 6.40 cents per pound, which is less than for any other output listed in the table. If the butterfat production was 2000 pounds per square mile, however, the hauling costs would be less, because a shorter average haul would be required to secure the same volume of business, and the most economical output would be 350,000 pounds of butter per creamery. Thus a plant could advantageously expand its business from 250,000 to 350,000 pounds of butter in an area producing 2000 pounds of butterfat per square mile, but not in a region producing only 1000 pounds per square mile. This illustrates how the supply of available raw material operates as a check upon size of business. The more perishable the raw material, the more limited the available supply.

TABLE XXV. COMBINED HAULING AND MANUFACTURING COSTS OF LOCAL CREAMERIES (Cents per Pound)

Output—lbs. of butter	*Manufacturing cost*	HAULING COSTS		COMBINED COSTS	
		2000 lbs. per sq. mile	*1000 lbs. per sq. mile*	*2000 lbs. per sq. mile*	*1000 lbs. per sq. mile*
50,000	7.14	0.79	1.15	7.93	8.29
100,000	5.40	1.13	1.58	6.53	6.98
150,000	4.52	1.36	1.94	5.88	6.46
200,000	4.20	1.58	2.23	5.78	6.43
250,000	3.90	1.77	2.50	5.67	*6.40*
300,000	3.68	1.94	2.73	5.62	6.41
350,000	3.51	2.09	2.95	*5.60*	6.46
400,000	3.38	2.25	3.17	5.63	6.55
500,000	3.18	2.51	3.54	5.69	6.72
600,000	3.00	2.72	3.88	5.72	6.88

Area and density are also important in determining the size of retailing and wholesale establishments. The more widely spread the farm population, the smaller will the country stores tend to be, or the fewer of them at one trading point. The denser the population in any part of a city, the larger the stores, or the more of them. It is in the apartment house sections that " cash and carry " stores are most likely to flourish.

It is easy to see how competition affects the problem. If in the area producing 2000 pounds of butter per square mile, a second creamery should begin operating, and the two should presently divide the business equally, the maximum volume to which each could attain to advantage would be 250,000 pounds of output, at a combined cost of 6.40 cents per pound. Two creameries are not likely to establish themselves at exactly the same point, but they may establish themselves within a mile or two of each other, so that a considerable part of the supply territory of the two will overlap. In the case of marketing enterprises, it is not uncommon to find two or more establishments operating at one point. There may be two or three grain elevators at one shipping station, or six or eight potato warehouses. Having two or more establishments in place of one is equivalent to reducing the density of production.

There are other types of enterprises in which area is more of a factor than in the cases above mentioned. In the railway business, the volume of traffic per mile of road varies with the length of haul necessary to secure a given volume of business. The transcontinental lines had to build through territory furnishing but little traffic in order to reach the tonnages waiting for them on the Pacific Coast. In the telephone business, the thinner the population, the more miles of wire that must be strung to connect a telephone with a local switchboard. Farming is perhaps the extreme example. The more land included in one farm, the farther that produce must be hauled, and the farther that the workmen must travel to and from the fields; also the more difficult it is to supervise the work.

The Supply of Cost Elements Available.—In the aggregate, a good many enterprises are limited or influenced in size by the supply of labor or capital or equipment available. Large enterprises are not likely to be limited for long by a lack of labor, although they may be by a lack of sufficiently skilled labor. The type of enterprise whose size is most likely to be adjusted to the labor supply is the

small enterprise depending to a considerable extent upon family labor. There is a very pronounced tendency for farms to be no larger than can be handled by an average-sized family. Farmers who expand their businesses beyond this and employ hired labor find themselves at a relative disadvantage. The family labor is the cheaper labor, for the simple reason that the boys and girls have to be fed and clothed anyway, and any use that can be made of them is nearly clear gain. The small retail store is also in many cases a family enterprise, and likewise many shops and small manufacturing establishments; and this is one of the important reasons for their remaining small.

Lack of capital is also frequently a limiting factor. Either the entrepreneur cannot borrow the funds needed to expand his business, or he hesitates to do so for various reasons. We have seen how the development of the corporate form of business organization made possible the assembling of large amounts of capital. There can be no doubt that this has been one factor in the increasingly larger size of our business enterprises.

Specialization by Tasks.—In general, any business which lends itself to specialization by tasks is more likely to expand than one which does not so lend itself. As such a business expands and introduces more specialization by tasks, its costs per unit of output with the same management may rise very little, or even decrease. This is partly because specialization by tasks means standardization of tasks and of supervision of tasks, and hence reduces management, and partly because the work of each man is so simplified that he needs very little supervision. The result is that the input of management per unit of labor is less in many large factories than in most small factories merely because of differences in the extent to which specialization by tasks has been carried. It is in those lines of production in which specialization makes little headway, such as farming, retailing, tailoring, and repairing of all kinds, that the unit still remains small.

Standardization of Product.—A product which can be standardized, like cotton yarn, or pig iron, or breakfast food, or toothbrushes, requires far less supervision than one which cannot, such as tailor-made suits, or dental work, or oil paintings, and hence lends itself much better to larger units. In millinery establishments in large cities, the business of making women's hats is standardized to a considerable extent; but a great deal of supervision is

still required. The basis of the organization is a woman working at the head of a table who supervises the work of a small group of helpers. Shoe manufacturing, in spite of its standardization, still requires a considerable supervision. In particular, the product has to be carefully inspected before it is offered for sale. Merchandising is a business which involves dealing with people, no two of which are exactly alike, and no one of which reacts the same all of the time. Hence it has proved to be rather difficult to standardize in many respects. All personal service is difficult to standardize. There is obviously a direct relation between the extent to which the product is standardized and the size of the unit. Those businesses whose product is difficult to standardize tend to remain small.

Standardization of Raw Materials.—The more carefully the raw materials which enter into a product must be inspected, the more management that will be required, and other things being the same, the smaller the business. The raw materials of shoes and cigars are examples of this. A merchant who does not devote a great deal of close attention to the buying of his stock of goods does not remain long in business.

Adaptability to Machine and Power Manufacture.—Closely related to all the foregoing is the adaptability of any line of production to machine manufacture and the use of power. Shoes were made in very small establishments in the days before stitching and soling machines were invented; likewise books, furniture, wagons, etc. Part of the reason for this is that machinery requires less supervision than the amount of labor whose place it takes. A more important reason is that power machines generally require a considerable volume of business in order to be operated economically, but once this volume is obtained, the costs are so low as to put the small handwork shops out of the running, except, as already pointed out, in case of products or raw materials that cannot be standardized. Dairy herds are increasing in size with the introduction of milking machines. The successful invention of a cotton-picking machine would make over the South in a few decades.

Adaptability to Scientific Management and Functional Organization.—There can be no doubt that those industries which lend themselves to the kind of analysis of tasks and men and tools which constitutes scientific management, and to the functional

organization that accompanies it, are more likely to increase in size than those which do not so lend themselves. The unit of operation in coal mining, for example, will undoubtedly expand if large-scale factory methods can be adopted, as is now being urged by leaders among the operators.

Combination of Enterprises.—The more enterprises of a seasonal nature, or that can be dovetailed in other ways, that can be combined in one unit, the larger the total volume of business handled over a period. This is because management is dovetailed also—there is something to be managed at all times. On the other hand, the product and the raw materials and methods are less standardized, and the management is less specialized, and this keeps the input of management per unit of product rather high. Generally speaking, the highly specialized farms—the cattle ranches, the specialized wheat farms, the sugar plantations—are larger than diversified farms. This is because there is only one enterprise to be managed, and everything is standardized and adapted to its needs. Except for brief periods, very little more planning is needed for a thousand acres of wheat than for fifty acres. Not only does a small acreage of a crop require almost as much managing as a large one, but the more crops that are combined, the more chances for conflicts in the use of labor and equipment; and it is these conflicts that multiply the troubles of management. Side-line enterprises, such as are taken on by small manufacturers and merchants, while they dovetail with the regular enterprises in the use of management, in general so increase the burdens of management, especially if they develop conflicts with the main enterprise, that many managers carefully avoid them after a little experience with them. They customarily say that such enterprises "cause more trouble than they are worth," or that they "cause more bother than the main enterprise." They say somewhat the same things about small by-product enterprises. Undoubtedly the management requirement is one of the important reasons why side-line and by-product enterprises develop so slowly in many fields—why farms diversify so slowly, and many potential by-products of manufacturing are still wasted.

A closely related circumstance is that small businesses frequently do not have enough left-over time and equipment, or left-over raw or partly-manufactured materials, to warrant setting up side-line or by-product enterprises. If they did, they could

assign a special manager to it who understood it and confined himself to its particular problems, and this would save them from the burden of managing two different sorts of enterprises. This points out one of the economies of a large volume of business: in the first place, it is more likely to have the necessary volume of waste material to support a by-product enterprise; or the necessary left-over plant or labor at certain seasons of the year; or the necessary volume of need for a complementary product; and in the second place, it is better able to organize management on a basis to take care of it. The general manager can delegate most of the management of a by-product, supplementary, or complementary enterprise to an assistant.

Types of complementary enterprises which large businesses set up and which small ones cannot afford, are the following: research laboratories for developing new methods; testing laboratories for testing raw materials and products—thus the larger flour mills of Minneapolis all have laboratories where they analyze samples of wheat and carry on milling and baking tests, whereas the small country mills either hire this service or do without it; statistical departments for analyzing such things as trends in prices and production, the territorial distribution of demand, the relation of inputs to outputs for their various elements of production; legal departments, for looking after all their contracts, and handling cases arising from accidents to employees, or from complaints concerning their product, etc.; claims departments, for handling claims against railroads; publicity departments; credit departments, etc. The farm is so small a unit that it cannot maintain any of the services just outlined; consequently the demand for publicly supported agricultural experiment stations, extension workers, and all the services centered in the United States Department of Agriculture. Because small independent mining companies cannot each maintain research and testing laboratories, they have induced several states to establish state mines experiment stations. The only reason that the small independent merchants in most places have no publicly supported services of this kind is that they have not generally recognized the need for it strongly enough.

Economies in Buying.—If a business is one in which buying can be done appreciably more cheaply in large quantities than in smaller lots, then this becomes an influence toward larger units. The economy may come from securing low rates, either simply because of

taking larger lots, or from buying more directly in addition; or it may come from securing car-lot rates on shipments and drayage.

Economies in Selling.—In general, large enterprises do more advertising than smaller ones; they employ more advertising mediums and run larger advertisements. But it is doubtful if their advertising costs are any larger per unit of sale. An exception to this will be the business which is expanded beyond its normal territory and has to fight constantly to maintain its sales. The same analysis applies to a traveling sales force, particularly if the large volume of sales is not spread over too wide a territory. It costs a company little more to take five large orders in one town than two little ones. It is doubtful if volume of sales is so important a factor in retailing. Given two sales forces each equally well adjusted to volume of sales, the chances are that the small sales force will sell about as cheaply as the large one. Large stores are able to introduce specialization to some extent in the form of cash girls, bundle-wrappers and the like; but this is at least partly offset by the constantly increasing need for supervision.

III. TRENDS IN SIZE OF BUSINESS IN THE UNITED STATES

Undoubtedly popular judgments as to the increasing of the size of business units in many fields of production are on the whole correct. But it may easily be that they exaggerate somewhat the extent of the increase and make it too general. Let us examine a few of the major fields of production from this point of view.

TABLE XXVI. CHANGES IN SIZE OF MANUFACTURING ESTABLISHMENTS IN THE UNITED STATES, 1899–1919 [1]

Year	*Number of establishments*	*Number of wage earners per establishment*	*Value of product* *
1899	207,514	22.7	$61,700
1904	216,180	25.3	74,300
1909	268,491	24.6	76,100
1914	275,491	25.5	92,600
1919	290,105	31.4	111,300

* At 1914 prices for manufactured products.

Manufacturing.—Manufacturing is the field in which the greatest increase is supposed to have taken place. Table XXVI is a

[1] Adapted from Tables 8 and 10 of "Integration of Industrial Operation," by Willard Thorp, *U. S. Census Monograph No. III.*

summary of the movement for all manufacturing establishments, combined in terms of two indexes of size, namely, number of wage earners per establishment, and value of product per establishment, for the twenty-year period from 1899 to 1919. There was a 53-per cent increase according to the wage-earner index, and an 80-per cent increase according to the value-of-product index. Number of wage earners is defective as an index because it does not provide for the introduction of labor-saving machinery. Value of product is defective because it is difficult to adjust accurately for changes in the price level,[1] and because it does not allow properly for changes in prices and types of raw materials and supplies used. On the whole, however, the second index is a better measure than the first. An 80-per cent increase in size of establishments in a 20-year period is a rather pronounced change. Mr. Thorp, however, in his treatment of this subject in his census monograph on "The Integration of Industrial Operation," very properly points out that much of this increase took place between 1914 and 1919, and may represent mostly the fact that plants were running more nearly to capacity in 1919 than in 1914.[2]

TABLE XXVII. DISTRIBUTION OF SIZES OF MANUFACTURING ESTABLISHMENTS IN THE UNITED STATES ON THE BASIS OF WAGE EARNERS 1909 AND 1919 [3]

	Number of Establishments		Increase	
	1919	*1909*	*Numbers*	*Percentage*
No wage earners	37,934	27,712	10,222	37
1 to 5 wage earners	141,742	136,289	5,453	4
6 to 20 wage earners	56,208	57,198	—10	—0
21 to 50 wage earners	25,379	23,544	1,835	8
50 to 100 wage earners	12,405	10,964	1,441	13
101 to 250 wage earners	10,068	8,116	1,952	24
250 to 500 wage earners	3,599	2,905	694	25
501 to 1,000 wage earners	1,749	1,223	516	42
Over 1,000 wage earners	1,021	540	481	89

[1] In the table, the correction is made on the basis of the Bureau of Labor index of wholesale prices, with two groups, Farm Products and Fuel and Lighting, omitted.

[2] P. 44. According to Table XXVI, 30 out of the 80 per cent of increase in value of products took place between 1914 and 1919.

[3] Adapted from Table 30, "Integration of Industrial Operation."

A more detailed study of changes by size groups and by industries shows why the figures for all industries as a whole do not indicate an even greater increase in size of establishments. According to Table XXVII over 60 per cent of all establishments employ 5 wage earners or less, and new enterprises of this sort are always starting in large numbers—16,675 of these started in the 10-year period from 1909 to 1919. In computing an average for all establishments, each of these counts for one. Under the circumstances, an average for all manufacturing establishments is bound to rise rather slowly. Of more significance is the rising of the percentages of increase in the table as one goes into the larger size groups. Not only was there an 89 per cent increase in the number of establishments employing over 1000 wage earners, but the establishments in this group employed an average of 2350 wage earners in 1919 as compared with 1880 in 1909. The fuller employment of the plants in 1919 can account for only part of this decided change. If these enterprises could be classified by value of products at different census periods and reduced to some comparable basis, the results would be much more striking.

In order to show the importance of considering trends in size by separate industries, Mr. Thorp made a special study of 18 of them, selected in such a way as to show different sorts of influences. Table XXVIII summarizes the results of this study. Volume of product is measured upon a strictly physical basis in this study. In three cases, input of raw materials is used instead of volume of output; and in the textile industries, number of spindles in place of volume of output. In several of these industries, notably salt, woolen and worsted manufactures, blast furnaces, leather and boots and shoes, the increase in size of plant was so pronounced that it resulted in an actual reduction in the number of establishments. In the silk industry, in contrast to the foregoing, there was so large a decrease in the size of the unit that it was accompanied by a conspicuous increase in the number of establishments. The decline for lumber and lumber products, and carriages and wagons, is due to fundamental changes in supply and demand; as are also the large increases in automobile and shipbuilding, and in blast furnaces and steel work to a lesser extent. Surely the whole picture shows a rather remarkable increase in size for a short period of twenty years.

TABLE XXVIII. PERCENTAGE OF CHANGE FOR 18 SELECTED INDUSTRIES IN THE UNITED STATES 1899 TO 1919

	Number of establishments	*Number of wage earners per establishment*	*Physical product per establishment*
Salt	—46	+153	+499
Manufactured ice	+270	+19	+59
Beet sugar	+183	+111	+71
Slaughtering and meat packing	+48	+58	+14 [1]
Cotton manufactures	+42	+4	+44 [2]
Woolen and worsted manufactures	—30	+90	+118 [3]
Silk manufactures	+183	—31	—32 [4]
Blast furnaces	—13	+22	+142
Steel works and rolling mills	+12	+82	+114
Lumber and lumber products	+13	+3	—13
Leather, tanned, curried and finished	—48	+168	+158 [5]
Boots and shoes	—9	+64	+68
Petroleum refining	+378	+1	+47 [6]
Coke	+15	+48	+95
Fertilizer	+42	+63	+101
Carriages and wagons	—63	—11	+4 [7]
Automobiles	+453	+1,613	+8,100
Shipbuilding, wooden	—14	+220	+114 [8]
Shipbuilding, steel	+268	+203	+302 [8]

[1] Index of materials used per establishment.
[2] Active producing spindles per establishment.
[3] Spindles per establishment.
[4] Active spinning spindles per establishment.
[5] Index of materials used per establishment.
[6] Crude petroleum used per establishment.
[7] Vehicles produced per establishment.
[8] Tonnage launched per establishment.

Mining.—Table XXIX shows that between 1902 and 1919 a very considerable increase took place in the number of wage earners employed in most types of mining establishments. In general, the numbers have more than doubled. This has been in spite of an increasing use of drilling and tramming equipment and other labor-saving devices. According to Table XXX, a good deal of this increase must have taken place between 1909 and 1919. Similar data for 1902 are not available. The decrease for the smallest groups was very pronounced. The percentages of increase then grow larger consistently up to the 501-to-1,000 group and then decline. The 9,814 petroleum and gas wells in operation in 1919 employed an average of about 10 wage earners.

These are omitted from the table because they represent an entirely different type of operation. The 2,300 quarries employed an average of 23 wage earners in 1919.

TABLE XXIX. AVERAGE NUMBER OF WAGE EARNERS PER MINING ESTABLISHMENT FOR SELECTED TYPICAL PRODUCTS, UNITED STATES 1919 AND 1902 [1]

	1919	*1902*
Coal—anthracite	578	209
Coal—bituminous	83	50
Iron ore	158	74
Copper	224	181
Lead and zinc	51	14
Gold and silver, lode mines	21	17
Gold and silver, placer mines	12	2

TABLE XXX. DISTRIBUTION BY SIZE OF MINING ESTABLISHMENTS ON THE BASIS OF NUMBER OF WAGE EARNERS; THE UNITED STATES, 1919 AND 1909 [2]

	NUMBER OF ESTABLISHMENTS		INCREASE	
	1919	*1909*	*Number*	*Per cent*
No wage earners	423	863	—440	—51
1 to 5	2,987	3,543	—556	—16
6 to 20	2,914	3,318	—404	—12
21 to 50	2,013	1,869	+144	+8
51 to 100	1,230	943	+296	+31
101 to 500	1,641	1,077	+564	+52
501 to 1,000	158	147	+11	+7
Over 1,000	84	125	—41	—33

Agriculture.—The general opinion in the case of agriculture is that the producing unit is getting smaller in place of larger. Table XXXI indicates that taking the country as a whole there is no clear trend in this direction. One has to go back to 1870 to find the farms averaging more acres than in 1920, and only in 1860 have they averaged more improved land. The trend since 1900 is rather toward more improved land per farm. The reasons for the uncertainty of trends in Table XXXI are partly apparent in Table XXXII, which presents similar data by geographic divisions. In the old Atlantic Coast states, acreage of all land per farm has been remaining about constant, but improved land has

[1] From Table 12, *Census of 1920*, Vol. XI, and Table 23, p. 68, and Table 2, p. 510, *Special Reports, Mines and Quarries.*

[2] Not including petroleum and natural gas wells. From Table 15, *Census of 1920*, Vol. XI, and Table 20, *Census of 1910*, Vol. XI.

TABLE XXXI. ACREAGE OF ALL LAND AND IMPROVED LAND PER FARM IN THE UNITED STATES, 1850 TO 1920 [1]

Year	*All Land*	*Improved Land*
1920	148	78
1910	138	75
1900	146	72
1890	136	78
1880	134	71
1870	153	71
1860	199	80
1850	203	78

TABLE XXXII. ACREAGE OF ALL LAND AND IMPROVED LAND PER FARM BY GEOGRAPHIC SECTIONS, UNITED STATES 1920 AND 1880 [2]

Divisions	ALL LAND		IMPROVED LAND	
	1920	*1880*	*1920*	*1880*
New England	108	104	39	63
Middle Atlantic	95	95	62	68
East North Central	108	107	81	77
West North Central	234	142	156	86
South Atlantic	84	157	42	56
East South Central	75	135	42	54
West South Central	174	179	64	60
Mountain	481	159	123	88
Pacific	240	379	102	228

been decreasing in some states very rapidly. In the Southern states, the farms clearly have been decreasing in size. This reflects the breaking up of the large cotton farms into small holdings worked mostly by negro tenants. In the East North Central states, the conflicting influences offset each other almost to a standstill. In the West North Central states, the great prairie region, there has been a pronounced increase in size of farms. On the Pacific Coast, the increase in fruit growing has greatly reduced the average size of farms. The increase in the Mountain states is principally the result of including more and more ranches as farms. Probably it is safe to say from these data that in the main in agricultural regions of the United States outside of the South, farms have been getting larger, particularly in terms of improved acres. The decline in the Eastern states is mostly the result of the increasing amount

[1] From Table 11, *Census of 1920*, Vol. V.
[2] From Table 11, *Census of 1920*, Vol. V.

of truck farming and the so-called "abandoning" of land, which means for the most part letting it go back into meadows and pastures.

Acres, even improved acres, is a poor measure of the size of the farm business. Undoubtedly there has been an increase in the proportion of the land in farms planted to crops. The U. S. Department of Agriculture has computed an index of total crop production by years since 1890. The average index for the four years, 1890 to 1894, is 62; for the four years, 1920 to 1924, it is 110.[1] Reduced to a per-farm basis, these indexes stand in the relation of 100 to 126 respectively.

The probable long-time trend in size of farms in the central states is toward fewer total acres, perhaps toward slightly fewer improved acres, but more crop acres per farm and more productive live stock per farm. The volume of output per farm will surely increase.

The same trends will prevail in Canada, Australia, and probably all the newer countries. The long-trend time in the older countries has been toward smaller farms measured in acres, and in some countries even when measured in volume of output. The size of farms, measured in productive acres per farm, has decreased in many of these countries somewhere nearly as rapidly as volume of output per acre has increased. This surely has not been true for England and perhaps some other European countries, in the last seventy-five years.

Table XXXIII presents a comparison according to the data of the most recent census of the average acres per farm of "agricultural land" for 12 countries selected so as to show the extreme variation now prevailing in the world. "Agricultural land" as here used includes land in crops, permanent pasture and meadow. If the land in these countries was all equally improved, the variation would be reduced very greatly. For example, China has more unimproved land than Japan. Crop yields also vary greatly, Italy's being lowest for the European countries mentioned, and France's next to the lowest.

[1] *1924 Yearbook of the Department of Agriculture*, Table 695, p. 1109.

TABLE XXXIII. AVERAGE ACRES OF AGRICULTURAL LAND PER FARM FOR 12 SELECTED COUNTRIES [1]

Country	*Number of farms*	*Acres of agricultural land*
Japan	5,467,277	3.0
China	59,223,904	6.9
Belgium	829,625	8.5
Germany	5,068,597	15.5
Italy	3,064,077	21.3
France	3,226,000	27.0
Sweden	428,026	29.0
Ireland	554,518	31.2
England and Wales	416,100	74.0
United States	6,448,336	112.0
Argentina	210,268	1571.0
Union of South Africa	90,251	2540.0

SUGGESTIONS FOR FURTHER READING

Willard L. Thorp discusses the size of industrial establishments in Chapters II and III of *The Integration of Industrial Operation*, Census Monograph Number III (1924). L. C. Marshall and L. S. Lyon consider the question of size of the business unit in Chapter XV of *Our Economic Organization* (1921); likewise Alfred Marshall in his *Industry and Trade* (1919), Book II, Chapters III and IV. In L. C. Marshall's *Business Administration* (1921), pp. 555, 602 ff. and pp. 795 ff., are readings pertaining to the subject. R. H. Lansburgh's *Industrial Management* (1923), Chapters X and XXXVIII, discusses several questions growing out of the size of business units.

For a discussion of the size of farms, the reader is referred to H. C. Taylor's *Outlines of Agricultural Economics* (1925), Chapter XIII, and to G. F. Warren's *Farm Management* (1914), Chapters 7 and 8.

PROBLEMS

1. In what sort of units are the sizes of the following commonly measured?
   a. Universities.
   b. Steamships.
   c. Residences.
   d. Apartment houses.
   e. Meat-packing plants.
   f. Canning factories.
2. Criticise volume of output as a measure of size of the following:
   a. Coal mine.
   b. Mail-order houses.

[1] From an unpublished study by Carl R. Arnold made under direction of the author.

c. Flour mill.
d. Bank.
e. Wheat farm.

3. Would *current expenses* be a better measure in each case? *Value of fixed plant?*
4. Why does the Census give so many different measures of size?
5. How would you measure the "size" of a student?
6. Would the efficiency of a student affect his size? Explain.
7. Assume additional receipts as follows: 200, 400, 500, 550, 500, 400, 200; and additional expenses as follows: 400, 350, 300, 250, 350, 400, 550. Construct a diagram like Figure LII.
8. How would the diagram be different for a lazy unambitious entrepreneur?
9. Whose management cost line is likely to rise most rapidly, a hired manager's or an entrepreneur's? Why?
10. Draw a diagram to show that cost of effort is one of the determining factors in the size (measured in number of rooms) of a house you will prefer to live in.
11. Why will the entrepreneur often produce beyond the point of least-cost combination of the other elements?
12. Compare two individuals with whom you are acquainted as to (a) capacity and (b) efficiency. (c) What seem to be the reasons for these differences? What differences in natural abilities and aptitudes are involved? What differences in training and experience?
13. How would Figure LIV be different for a good manager than for a poor one?
14. Construct a diagram showing an assistant manager employed in such a way as to reduce total profits.
15. Explain how the over-functionalizing of a small business may reduce profits.
16. Assume inputs of fixed plant per unit of output varying as follows: 50, 40, 30, 35, 40; and inputs per unit of output of the accompanying management varying as follows: 100, 70, 35, 30, 25. Compute the least-cost combination assuming cost-rates as follows: fixed plant, $5; management, $2. Suppose prices of the product were to double during the year, with no change in the cost-rates of fixed plant—how would this affect the situation?
17. A man may have the ability to handle a larger business as well as the desire to operate one and still continue running a small business. Why?
18. If by means of specialization of tasks and using more machinery, the complements of management in Figure LVII could be reduced one-third, how would the location of point HP be affected?
19. Other prices remaining the same, what will be the effect upon the location of HP of doubling the cost-rates for labor?
20. Is competition a cause or an effect of the size of a business unit?
21. Explain how competition and density of population affect the size of corner groceries.

22. There is much competition between ice cream factories in small cities and factories in large cities nearby. How is it likely to end?
23. List five types of business enterprises that are small and give reasons why each one does not enlarge.
24. Why are there such few large business enterprises in a country like India?
25. Is area more of a limiting factor in agriculture than in manufacturing? Explain.
26. Is there any relation between quality of product and size of the business unit?
27. What is the smallest business unit you know of? What is the largest?
28. Karl Marx predicted that all small business units would soon disappear. Do you agree with him? Why?
29. Show that the same factors that affect the size of a business unit tend to limit the size of a university.
30. Refer to Figure LIV. At point N, the costs per unit of product are labor, \$1.40; power, \$.50; equipment, \$.50; supplies, \$.50; materials, \$.75; total \$3.65. The selling price is \$4.65. The owner hires an assistant manager whose cost per unit of product is \$1.00, but by so doing the costs of the other factors become respectively, labor, \$1.25; power, \$.40; equipment, \$.45; supplies, \$.40; materials, \$.65; total, \$4.15. Draw a diagram similar to Figure LIV showing the situation after the assistant manager has been hired. Has point N been changed? Why? Has the entire N curve been changed? Why?
31. Suppose the business expands to the eighth input, but no additional managers are hired. What happens to the management cost per unit of output as the size of the plant grows? With the larger plant, would it be possible for N to be lower and the profit per unit higher than in Figure LIV? In order that this might occur, what must happen to the costs of the other factors? How would this be brought about?
32. Add to the diagrams drawn in No. 30, an N′ curve illustrating the situation described in No. 31. Assume costs for all factors, including management, and complete the diagram so that it will be comparable to Figure LIV.

PART FIVE

THE COÖRDINATION OF PRODUCTION

CHAPTER XXII

THE DYNAMIC NATURE OF ECONOMIC SOCIETY

Thus far we have carried our analysis of the economics of production through the individual producing unit. We have yet to show how the activities of individual producing units become coördinated in that complex mechanism which constitutes modern economic society. No producing unit operates for itself alone. All types of them are closely interdependent with numerous other types which come before and after them in that long series of production processes which bring the goods from the primary producers to the final consumer. The most obvious of the interrelationships are those between the primary producing units, the various marketing units, the transportation units, the financing units, and the household and other consuming units. The primary production process is frequently broken up into several stages carried on by separate types of producing units. There are usually several different types of marketing agencies involved, beginning with the local buyer in some cases, with brokers or selling agents in others, and ending with the retailer. There may be several types of transportation agencies in between these several marketing agencies. If any one person were assigned the task of coördinating such an array of activities and processes, he would probably throw up his hands and say it was impossible. But somehow or other, and with a considerable degree of success, society working as a whole does accomplish it. It is the purpose of Part Five of this treatise to explain how it is done.

Before we can properly undertake this explanation, we must understand a few more things as to the nature of economic society itself. One of these is its essentially *dynamic* nature. A purely *static* society would be one in which everything is fixed as to quantity and type; a purely *dynamic* society would be one in which everything is constantly in a state of flux or change. The society in which we live is somewhere between these two extremes. Some things are fixed absolutely, such as the amount of coal in a given

deposit; others are fixed for the time being, such as the number of square feet of floor space in a given factory building, or the capacity of a power plant. Others fluctuate within narrow limits, such as the physical strength of a workman or his mentality. At the other end of the gamut are such uncertain things as the weather, yields of crops, or daily receipts of live stock; or such constantly changing things as the output of flour mills, prices of wheat, population, imports, exports, etc. But if any part of society is in a state of change, then all parts are affected by it. No system of economics will therefore suffice which does not provide for change. Hence our system of economics must be dynamic.

I. THE STATIC FACTORS IN SOCIETY

Before we proceed further, let us obtain a clearer picture of the static and the dynamic elements in economic society and their relation to each other. At the basis of all, of course, is the physical universe. So far as the earth is concerned, superficially, and to all practical purposes, the materials which compose it are largely in a state of rest. Only the air and the water, and whatever particles of earth they carry with them, seem to be in motion. Whatever other gross motion there is, is produced by the living organisms, including man, that inhabit the earth. When we consider the earth as a whole, however, we know that it is not only rotating on its axis, but moving in a vast orbit around the sun once in 365.24 days. These larger movements of the earth suggest the type of motion which probably occurs within the atoms which compose the materials of the earth which seem superficially to be so much at rest. Probably the smallest particles which make up matter are in a state of constant motion somewhat like that of the planets which make up the solar system and the universe at large.

The characteristic of this motion is that it is continuous, and unless disturbed, at a constant rate, and in the same direction or over the same path. When sound travels, it proceeds as a vibratory motion; likewise light. Vibratory motion is not in the same direction constantly, but it is over the same path. Now it makes little difference for our purposes whether the materials of the universe are absolutely at rest, as most of them appear to be, or whether they are in motion, like the earth itself, or the ultimate particles of matter, so long as the *motion itself is unchanging*. Either will give us permanence and continuity in the universe.

The rotation of the earth on its axis, as long as it continues at the same rate and on the same axis, gives us as unchanging conditions as if it were absolutely at rest. So with the movements of the ultimate particles of matter. Their movements, it is true, may be profoundly affected by changes in temperature or pressure and the like; but even then, they always respond in the same way to the same changes in conditions. It is for such reasons that we speak of the laws of nature as *immutable.* There seem to be unchanging laws which keep everything in place, or in motion according to definite patterns. And these give to the physical universe a high degree of permanence. What the world would be like without this permanence, is hard to conceive.

Biologically also, there is a high degree of permanence in the universe. Plants grow mostly by building one like cell upon another. In their reproduction, one generation simply repeats another. " Like produces like " is one of the first laws of the biological universe. Man, being biological, himself contributes in this way to the permanence and continuity of the universe.

Habit.—But there is a special way in addition to the foregoing in which man and at least the higher animals contribute to the permanence of the world—this is in their capacity to form *habits.* Acts repeated after themselves by the same persons or animals solely because they have been done by them before, are called habits. Thus for five years I had a certain route which I followed on my way to the office each morning. Since last September, my office has been located in another part of the campus, making it advisable for me to take a different route. But even this morning, three months away from September, on my way to work, I got to thinking about the subject of to-day's lecture and presently found myself following the old route. Nearly all of our actions are habitual. Even if some of our major activities are the result of what we call " taking thought," it is only the broad outlines of our activities that are so determined. For example, I may take thought as to which route I shall follow: but after I have decided this, all the rest is a matter of habit. The motions of such everyday activities as walking and talking are largely habitual; likewise those of dancing and swimming. They have to be " learned."

We make a mistake if we limit habit to physical activity. Our thinking follows old action patterns the same as the movements of our hands and feet, although perhaps not so pronouncedly. Ed-

ucators talk much about teaching young people how to think. What they really mean is establishing certain mental habits. If one has a good scientific training, his mental habits take him unconsciously over a route which leads to sound logical results. One who has not been scientifically trained has habits which lead to fallacious conclusions. Instead of proceeding logically from premise to conclusion, such persons are likely to follow simple associations of time or place or resemblance, or primitive analogies —like that of business prosperity and a Republican administration, or like that of handling toads and thus getting warts on one's hands, or restricting output of labor and thus furnishing more jobs, or putting more currency into circulation and thus making "money more plentiful," etc. But whatever the mental habits of a people are, whether good or bad, they make for stability in thinking. Cataclysmic events, such as wars and famines, may throw them off the beaten track of their thinking; but usually not for very long. Most changes in attitude come gradually, and a jot at a time. As Bagehot expressed it in his *Physics and Politics*, "An additional turret is built upon an old style of architecture, and very slowly indeed is the fundamental style of architecture changed."

Custom.—Resembling habit in some ways, and contributing almost equally to the permanence and continuity of the universe, is the phenomenon of custom, which is properly defined as *the repetition of acts or ways of doing solely because they are practices of the older generation now living, and probably of many generations gone before.* The difference between custom and habit, is that the repetition in habit is always by the same person after himself, whereas the repetition of custom is always after the older generation. Practically speaking, the line between custom and habit is hard to draw. Suppose that a practice has persisted for a generation or two; is the individual who repeats it following his ancestors, or merely obeying a habit which he has acquired by himself? The first time or two that he performed this act, he was no doubt imitating someone else, perhaps his parents; but after that, habit came into its rôle and imitation stepped out. Society being continuous, a new generation being born every instant, at any one time there exist people who are acquiring a practice by the custom process of following one's predecessors, and others, and these by far the larger class generally, who are blindly following a habit. It hardly seems necessary to mention examples of customs. All the affairs of everyday

life are bound round and interwoven with a mesh of customs—our daily social and business intercourse, our manner of conducting ourselves in public and private life, at the theatre, at dances, at meals, at the office, on the grain exchange, at a committee meeting, etc.

Not too much emphasis can be placed upon the point that the repetition of custom and habit must be solely because of earlier performance. The planting of potatoes at a certain season of the year is probably not a custom, since the continuance of the practice is undoubtedly due to the better crops thus secured; but planting on a particular day each year, or at a certain phase of the moon, would be due to custom. Waking up at the same time each morning may be due to a habit; but it may also be due to an alarm clock.

Traditions.—Just as ways of thinking may become habits, so may they become customs, although in this case they are called *traditions*. No doubt we derive the larger part of our ways of thinking about things from our predecessors, in some cases, from our predecessors so far back that we refer to them as ancestors. A generation must be bold indeed to claim for itself any considerable originality in the ideas which it proclaims. Our institutions of education are maintained in large part for the very purpose of imposing upon the next generation the set of ideas to which we adhere, and which we in our present wisdom believe to be sound and right. The " original " thinkers of the next generation will probably be those who escape from the influence of the present generation of " teachers."

Conventionality.—Closely related to customs and traditions are *conventionalities*, which are ways of doing which are imitated from our contemporaries, repeated just because other people are *now* doing them. Custom requires *down* transmission; conventionality, *cross* transmission. The line between custom and conventionality is even harder to draw than the line between custom and habit. Even for a single act or way of doing, cross and down transmissions are likely to be going on at the same time. The Japanese, for example, introduce some Occidental manner of dress, which spreads far and wide among the people. If it never really takes hold, and presently dies out, it will go down into history as a fashion or a *fad*. It may, however, seem to the Japanese to have some lasting merit, or appeal to the fancy, so that it presently becomes a

clothing *habit* for some of the people, and eventually for all of them. It is during this state of being adopted by all that it is properly called a conventionality. But even while it is still in process of being generally adopted, somewhere in Japan it is already being passed on to the next generation as *clothing custom*.

It is well for us to obtain a clear notion of a conventionality because of its relation to the static and dynamic analysis. From one point of view, the conventionality process adds stability to society—it assures to any practice *mass* of action. The combination of continuity of action which custom gives, with mass of action which conventionality gives, makes for a higher degree of stability than either could give alone. From another point of view, however, conventionalities are themselves changes at the time of their origin, and hence represent a dynamic element in society.

Ways of thinking are as likely to become conventional as ways of doing. Thus we have schools of thought which may dominate the thinking of a whole nation for a generation or two; or perhaps sets of ideas with respect to world conditions—for example, with respect to disarmament—that become generally accepted for a period.

The Bases of Custom, Tradition, Conventionality, etc.—It will add something to our appreciation of the static value of custom, tradition and the like if we consider the reasons for their existence.

Most fundamental of the reasons that past performance causes continued performance, is the *social sanction*. Society has a kindly feeling toward the old ways of doing, and looks askance at new ways. The individual who is about to act feels safer even on his own account if following in the old paths, and feels ill-at-ease and uncertain of himself if setting out on a new course; and when, to this natural diffidence of his own, is added the diffidence and even disapprobation of his fellows, a strong presumption is established in favor of the old. This disapprobation of society is no slight influence in many cases; the farmer, for example, who undertakes to farm "according to the books," is sure, in many sections, to be made the subject of much ridicule. There seem to be fundamental human traits at the bottom of this attitude of the group toward the innovators—an endowment of intolerance of those who do not conform to our ways, a suspicion of strangers, and antipathy toward those different from us and following ways strange to us.

There may also be historical reasons for the attitude of the people toward change. Perhaps on the whole, the old ways have been kindlier to the masses than the new ways. Given time enough, a people inures and even adjusts itself to almost any lot—it is the readjustment, then, that seems to cost. Change has usually been instituted by those in power, too often as acts of tyranny and oppression. Even in its justifiable progress, the race is extremely careless of the individual. One has no difficulty in understanding, therefore, how a tradition to oppose all change may have developed among the masses. It is only recently that society has learned how to make progress safely by breaking from old ways, and only in a few favored portions of the world at that, so that nowhere has time enough elapsed for the setting up of a new tradition to look kindly upon changes.

Most men also have a feeling for order and regularity which makes them want to fit into their proper place in the system, and more especially to want others to do so.

Society is thus arrayed on the one hand against the individual who proposes changes, and the individual, on the other hand, is a craven who fears the disapproval of his fellows and is much given to courting their approval.

The social sanction in itself is no inconsiderable influence for regularity, especially among unlettered peoples, but there is usually imposed upon the simple social sanction an *ethical* sanction, which, after all, is only a phase of the social sanction. The old ways now become the right ways, and virtuous living comes to consist in acting strictly according to old practices. All innovation is looked upon as evil. The ethical sanction has the further basis that changes and departures from precedents have an *ex post facto* effect—it is not " fair " to change the rules of the game after the game is on. Furthermore, a custom, being seldom varied from, has a strong semblance of justice in that it treats all alike. Deny a man what he has been accustomed to, and he will denounce you as unjust, even though he was receiving far more than his share before. This is why customary prices were called "just prices " in the Middle Ages. The landlord in England who tries to raise the rents on his estate is not a mere disturber of the peace; he is a wicked and greedy tyrant.

There may even come to be imposed on the social sanction a *religious* sanction. The reference here is not to the priestly or

religious sanction of particular practices, but to the piety of simply sticking to the old whatever it may be. The gods issue their mandates only at long intervals, and in all the time between, pious persons persist in the old rites and observances. Innovation is thus looked upon as sacrilege. Is not this excellent training in conformity? And will not some of the virtue that inheres in it spread by contagion to the non-religious spheres of human conduct? There seems to be abundant evidence that in those parts of the world to-day where the gods still regulate many of the affairs of men, conformity is looked upon as the highest order of piety. Surely China and India substantiate such a statement.

Unconscious imitation is the basis of much repetition. The imitation here involved is not the deliberate copying of other acts, but the imitation which results from the power of suggestion which inheres in almost any act. In suggestion, a mental state is aroused which has an act for its sequent—in imitative suggestion the act suggested is one like the original. By it, certain practices spread across society as conventionalities, and down through the years from generation to generation. Bagehot speaks of it as developing and propagating national characters, such as the American type produced close to the frontier line.

The old ways are sure of being continued for a long time for no other reasons than ignorance and the laziness of mankind. Men may be entirely ignorant of any other ways than the old, or even if they are aware of them, will find the best known way always the easiest at the first. Innovation is, therefore, uncomfortable for other reasons than the disapprobation of the group.

One must not overlook in this connection the importance of the habit-forming aptitude of human beings, and of the permanence of the physical universe, and the immutability of nature's laws, as furnishing a secure foundation upon which the sub-structure of custom can be reared. Take out of custom all the repetition that comes merely as a result of unconscious reflex action, and a large part of the continuity of society would vanish. If the seasons could not be depended upon, much of our production and consumption could not be stabilized at all.

Legal Custom.—The social sanction which is basic to custom very easily ripens into a *legal* sanction. Then we have custom as a legal concept. Following are several definitions, derived from legal sources, of custom as the term is used in law.

"Custom: A usage or practice of the people, which, by common adoption and acquiescence, and by long and unvarying habit, has become compulsory, and has acquired the force of a law with respect to the place or subject-matter to which it relates." [1]

"Customs result from a long series of actions constantly repeated, which have, by such repetition, and by uninterrupted acquiescence, acquired the force of a tacit and common consent." [2]

"In law, collectively, the settled habitudes of a community, such as are and have been for an indefinite time past generally recognized in it as the standards of what is just and right; ancient and general usage having the force of law." [3]

As will be apparent from these definitions, custom at law has to do with the same repetition phenomena that we have been discussing, but here the reference is not to the simple tendency to repetition resulting therefrom, but instead to the *force* of *constraint* thus developed. As a result of the force thus arising, the individual is restrained in his conduct with respect to the practice in question, and made to conform in his acts to the requirements concerning it imposed by some authority which the group has evolved. The authority may be merely the group acting as a unit in stern disapprobation, or it may be some institution that has evolved, such as a tribal chief, a priesthood, a court, or a fully developed modern state. This constraint need not always manifest itself in restricting action; it may be merely the acceptance of certain ideas or circumstances. Thus custom at law plays a large rôle in giving interpretations to contracts, terms of law, and words or phrases. Contracts on the stock exchange imply all the rules of the exchange, and leases of property imply all the rights and privileges common to leases in that locality. Considered from the same point of view that we have considered social and economic custom, *legal custom* may be defined as the *phenomenon of the growth of legal restraint out of the repetition of acts or thoughts.*

The various definitions of custom given by the courts do not agree always as to the scope of legal custom. A custom is not a good custom if anyone can show its beginning, says one opinion. "In use for an indefinite time past," "immemorial usage," "uninterrupted acquiescence," and "in use so long that the memory

[1] *Black's Law Dictionary*, p. 312.
[2] *Ibid.*
[3] *Century Dictionary.*

of man runneth not to the contrary," are all expressions that are frequently employed by the courts to describe custom. On the other hand, another opinion requires that the practice be "in use for the greater part of ten years." [1] Undoubtedly the courts vary their requirements with respect to time and place and the subject matter in hand. In a matter of interpretation, ordinarily only a short period will suffice. Thus if we include under legal custom both its force in interpretation and its force in restricting action, we must find a place in our category of legal customs for a very large list of practices.

Public Authority and Law.—As suggested under the last head, legal custom may still further ripen and become statute law, that is, a body of restrictions or rules of action that are adopted and enforced by a regularly constituted public authority, such as a central government, a state government, or a city council. Much of statute law is the mere codification of rules or practices already adopted. Thus the practices of the California mining camps became the mining law of California; and "tenant right" in England became the "Agricultural Holdings Act" of 1873. Thus it is proper to speak of customs as ripening into statutes. Sometimes customs never are written into statutes, but instead remain as "common law," which means that they become written into court decisions and become precedents for later court decisions. The common law is really nothing more than a body of customs which the courts have come to recognize as having legal sanction or acceptance.

Public authority itself owes its origin to the same processes as those which gave us the common law. The personal authority of the early tribal leader gradually grew into institutions vested with rights of control and equipped with machinery for imposing this control.

Closely identified with public authority are contracts. It is public authority which enforces contracts and makes them binding. Every lease is a contract; every promissory note; every bond or share of stock; every salary agreement.

Our interest at this time in custom law and public authority is in their potency as establishing influences in the world, as agencies for producing social permanence and continuity. To see the importance of law and public authority in this connection, we need

[1] *Words and Phrases Judicially Defined*, p. 1802.

only to compare the stability and orderliness of procedure in a country like the United States with related conditions in Mexico and Turkey in the last twenty-five years. To realize that the world at large is far from stability in this respect, we need only to think of recent events in Italy and Russia. But stability of government is not the only kind of stability involved. Statute laws generally carry over even though governments are overturned. Common law and custom nearly always carry over. Contracts are generally continued in force. Thus we can say that the law habits of a people are more stable than the governments themselves. This is well illustrated in a country like China. A small body of politicians and military strategists with small armies scamper here and there over the public stage; but the life of the four hundred millions of Chinamen goes on in its regular way, regulated by a body of customs and practices and institutions long established, well understood, and adequate to nearly all the needs of their time.

In fact, public authority, if it wishes to be effective, needs to give careful heed to the customs of a people. A statute which runs contrary to the long established customs of a people can be enforced only with great and continued effort. How the custom processes have derogated many a fine statute of our legislatures is within the experience of all. Whatever the origin of laws, none of them is able to function without regard to the repetition processes. "There is a custom beyond the law, contrary to the law, and according to the law" is the sententious dictum of an old court decision. Professor Ehrlich of Bukowina, in his *Seminar of the Living Law* has worked this idea out most freely. "The living law" according to his definition, "is that law which is not imprisoned within the rules of law, but dominates life itself." By the "rules of law" he means that which is in force merely in the courts and with the officials. To illustrate the contrast, he mentions the law of family: "There is scarcely a country in Europe in which the relations between husband and wife, between parents and children, or between families and the outside world in the form which they actually take in life, correspond to the forms of statute law." Professor Ehrlich did his work in Bukowina, a Slavic country of nine different peoples, engaged in agriculture, isolated, conservative. In Bukowina, "the old law still survives. The old law which is the popular law, and not the law of the ju-

rists, lives on under a thin veneer of modern statutes, and it dominates the transactions of people and their legal consciousness."[1] In a new country like ours, no doubt the living law and statute law are less frequently at odds with each other.

The amount of fixity in society brought about by legal arrangements and public authority is incalculable. Take the institutions of property, vested interests, and contracts, for instance. The modern world is sometimes described as a world in which contract has replaced custom. If two men enter into an agreement which is to last for ten years with respect to a piece of property, the status of this property and of the relationship between the two parties is fixed for that time. When we consider the vast and growing sphere of contract, in leases and transfers, in public and private agreements, in agreements entered into by business units partnerships and corporations, we are perhaps able to understand how the modern world can operate without all of the old fixity produced by custom.

Extra-Legal Authority.—The body of rules regulating human action which is outside of statute law and common law is probably larger than that within these classifications. All the by-laws of all the business corporations, coöperative associations, educational institutions, church and fraternal associations, athletic associations, and the like, are outside of statute law. To be sure, they depend upon statutory enactments for their validity, and judicial and executive machinery for their enforcement; but the by-laws themselves are extra-legal in origin, and were voluntarily assumed by the particular individuals affected.

Then there is a body of rules or understandings affecting human conduct which has not the support of the enforceability of contract. The rules under which all our athletic and other games are played, partly legislated for us by committees whose decisions we voluntarily accept, partly not even legislated, are examples of this. A better case is perhaps our almost slavish acceptance of spellings and interpretations of words as given in dictionaries. Our language has changed much more slowly since the first English dictionary was written than before. The market grades and classes commonly accepted by the trade, are other examples. The line between such agreements or understandings and customs is sometimes hard to draw.

[1] Review of Ehrlich's *Seminer of the Living Law*, by W. H. Page, Proceedings of the 14th Annual Meeting of Association of American Law Schools.

Geographical Stability—Non-Fluidity of the Elements of Production.—We now come to another group of elements making for stability in society, those connected with the geographical fluidity of the elements of production. In Chapter XVI we discussed the mobility of labor; in Chapter XV, the immobility of land; in Chapter XIV, the mobility of capital and capital goods. The non-fluidity of population is more particularly in evidence between different countries. Germany continues with its population of 328 per square mile and wages for common labor averaging probably less than 10 cents per hour, while the population of the United States is only 35 per square mile and wages for similar work average well over 20 cents per hour. In China, wages average probably less than 10 cents per day. Why do these differences continue? Why do not the people move? Immigration barriers are one check. But people do not move very much when they have a chance, except under extreme provocation such as during the potato famine in Ireland. The same differences continue between different parts of the same country—for example, between the North and the South of Italy, between our own North and South, and yet the people do not move. We try to explain this by saying that the people do not know of the better opportunities in the other lands; or that ties of kinship and friendship, and attachment to one's native land, are strong; or that people shrink from the hardships of living in a new country among strange peoples. But these are only part of an answer to the question.

Capital likewise moves rather cautiously from region to region even in the same country. Interest rates vary as much as 4 per cent within the boundaries of a single state. Differences in risk is the usual explanation given; but it is not the whole explanation.

Fixity of Investment.—Another important element in stability is fixity of investment in specialized capital goods or enterprises. A flour mill probably cannot be put to any different use of any importance. The brewers are now using their old vaults in some cases for the growing of mushrooms—otherwise they would have no use at all. Farmers can shift their land to new uses, but they ordinarily need several years for it. Crop rotations cannot be changed in a year; nor types of live stock enterprises. It takes many years to develop a good herd of live stock by ordinary means. The effect of this is to cause enterprises to shift slowly from place to place.

Part of the fixity is in the entrepreneur himself. He knows this type of business, this product, and he does not know another—perhaps will never really learn another.

Uncertainty of the Future.—Whenever the change made is on the basis of an analysis of the factors involved, the question always enters as to what to plan upon for the future. What can be expected as to demand and prices for the product? As to wages and labor supply? As to cost and supply of raw materials? Is the present increasing use of silk a continuing trend or a passing fad? Can the public keep on buying more and more automobiles? Not knowing the answer to such important questions as these, the general disposition of entrepreneurs is to continue in the old ways —to " keep the ills they have, rather than fly to those they know not of."

Ignorance of the Present.—Before one can forecast the future with any degree of certainty, one must understand the present. Many producers do not understand very well the reasons for their present good or ill success—they have not analyzed their present operations carefully enough to know why they have come to their present condition. Farmers do not know whether the price they are getting for their potatoes this year is really high or not taking into account as they should the size of the crop. They do not even know in many cases whether their yields are increasing or decreasing. Merchants often do not know whether or not their side lines are paying them; manufacturers whether their by-products plants are paying them. Under such circumstances, the disposition is to continue as one is doing so long as one gets along somehow.

" Universal Repetition."—Gabriel Tarde in his *Laws of Imitation* presents an analysis which in a way unifies all that has been said in this chapter as to the static elements in society. He finds that *repetition* is a universal phenomenon, far overreaching habit and custom, and that it is the one unifying principle of all nature. In his Chapter I, " Universal Repetition," he shows how, in the physical and chemical world, the biological world and the social world, repetition is the mode of operation, that as a result of this repetition comes resemblance, and that this resemblance, of yesterday and to-day, of parent and offspring, of ways of doing and thinking now and in times past, is what gives permanence and continuance to the universe. The physical and chemical world is explained solely by periodic, and for the most part, vibratory

motion—light, heat, sound, and constitution of matter itself. So in the world of life, cell follows cell, and generation follows generation. Similarly in society, by the various forms of imitation, word, thought, and act each succeed themselves as if they were generations of species; and this repetition means resemblance, and resemblance means continuance. This "universal repetition" and continuity, whether of the physical, the biological, or the social world, is a matter of great significance in economics.

II. THE DYNAMIC FACTORS IN SOCIETY

In the foregoing section are listed and described a large number of influences and circumstances which tend to keep society static. Some of these are purely physical, others biological, others social. In the last analysis, all of them work out as social influences; but the physical and biological influences are under all. In this section will be discussed various influences tending to make society dynamic, to keep it ever changing. These influences will also be found to fall within the physical, biological and social classification. The relation between the physical and biological and the social will in this case bring forth some interesting points for consideration.

Physical.—No more striking example can be found than earthquakes to prove that the physical world in which we live is not entirely stable. Earthquakes and volcanoes have many times within recorded history caused disasters of such magnitude as to disturb the economic and social equilibrium of whole nations, and even beyond—as witness of which is the recent Japanese disaster. Such disturbances so far as known come without any sequence or rhythm and without warning.

A more important type of physical instability is what we call weather as distinguished from climate. The older generation in almost any section of the country is certain to tell you that the climate has changed in their day, that not so many droughts occur as formerly, or not so much snow falls, or that frosts occur earlier, or later, than formerly; but official records so far as available generally disprove these statements. If we go back far enough, of course, we can find a time when the climate of a region may have been different. Minnesota was once mostly covered with an ice sheet. Some of what is now the Sahara Desert seems once to have had rainfall. But changes in climate so slow as these must have

been have no economic significance for any generation or series of generations. The effects of weather changes are of more consequence. Agriculture is affected most by them. But agriculture is so basic to urban industry and commerce that the whole of economic society becomes involved.

Rainfall is the most uncertain weather element; then frosts; then storms; then temperature in general. The 1925 cotton crop in the Black Prairie of Texas was almost a complete failure because of a scarcity of rainfall. For three years in succession, not enough rain fell in most of Montana to mature a crop of spring wheat. The Russian wheat area has also recently experienced several bad seasons. The rainfall of whole regions is sometimes over 50 per cent above or below normal. If this happens in regions whose normal rainfall is close to the margin, the effect is disastrous indeed. Cool summers and early frosts may half destroy the corn crop of the whole northern half of the corn belt. A severe winter freeze not long ago killed most of the orange groves of Florida. At the other extreme, unusually favorable weather may produce yields so large as to glut the market. The 1924 potato crop with a yield one-third above normal had this effect.

Fortunately, adverse weather usually does not strike all crops in the same year—a season which is poor for corn is likely to be favorable for small grain. Or if it does strike all the crops, it strikes only a few areas in this way, so that for the nation as a whole, if it is a large one, and especially for the world as a whole, good and bad average out in any one year or a short series of years. But there are cases enough to the contrary so that attempts are constantly being made to prove the existence of weather cycles, particularly of rainfall cycles. The statisticians of the U. S. Weather Bureau now working on these problems are inclined to believe that rainfall comes, roughly speaking, in sequences of wet years and then dry years; but they are not yet ready to say how long any wet or dry sequence is likely to last. Some have even gone so far as to attempt to relate weather cycles to the more or less periodic appearance of spots on the sun, or to planetary movements. If it could be proved that weather does come in cycles, and these cycles were so regular that their movements could be foretold, then production could be adjusted to it, just as it is to the seasons at present, and we could still have permanence and continuity in society. As it is, every change in the weather from

year to year becomes a disturbing element and keeps business in a constant state of uncertainty.

Biological.—The disturbances of a biological nature mostly relate to the same reproductive process which was cited in the last section as a basis of continuity in the world. First of all, there is not sustenance, nor even room, for all of any one species that would ultimately appear on the earth at any one time if reproduction continued unchecked for that species. The result is a constant struggle for existence between the different species. Some of the species prey upon others; some merely rob others of their room or plant food or sunlight. Under such conditions, any little accident of circumstance, such as a dry season, may give one species an advantage over the others, enabling it largely to crowd them out. Another kind of season may give another species the advantage temporarily. Thus the fortunes of different plant groups wax and wane. Just now a species of sow thistle is running wild in western Minnesota. European weeds, like the Russian thistle, introduced into our western prairies, have spread almost like grass fires. It is common knowledge how wolf packs grow and decline in numbers; likewise wild game, and even song birds.

The most disturbing of all biological influences is man himself. In the first place, he takes it upon himself to check the growth of certain species which he calls weeds and pests, and to encourage the growth of others which he finds economically useful to him. More than this, he assists certain species by artificial selection and breeding to increase their usefulness to him.

But far more important than this is the fact that man himself is capable of reproducing more rapidly than he can hope to increase his means of living. Thus it is always possible for the human population to press upon the food supply and clothing supply; and even more possible for it to press upon the supply of luxury and pleasure goods. Whenever in any country the population increase is held in check because to increase it would reduce the per-capita available supply of food, clothing, shelter, luxury and pleasure goods—all the things understood as included in "the standard of living"—it can be definitely said that the population is pressing upon the means of living. This is happening to-day over all of the earth's surface except perhaps in a few of the most recently settled regions where output per unit of inputs still increases as the population increases. In most countries of the earth, the population long ago

passed the point of highest average per-capita output.[1] In some, it has reached a point where it does not increase further because it refuses to lower its standard of living. France, whose population has remained around 38 or 39 millions since 1860, is the classic example of this condition. In other countries, the population has stopped increasing because less food and clothing per capita simply will not keep the body alive and enable it to reproduce. The population of China is commonly believed for this reason to have remained nearly stationary for several centuries.

In the 17th and 18th centuries in Europe, the population increased somewhat slowly. It was at the end of this period that Thomas Malthus stated his famous Law of Population, to the effect that the population tends to increase faster than the food supply, and hence to press upon the means of subsistence. But the Industrial Revolution came on apace in the next few decades in England, and eventually spread over most of Europe. Also vast fertile areas were opened up to farming in North and South America, Australia, and South Africa; and machinery was invented to reduce greatly the labor of farming these areas. The result was a great increase in the per-capita output, and a higher standard of living. In other words, the population of the Western World for a time failed to keep up with the increase in the means of living. But it gave evidence of what it could do if given a chance. Between 1800 and 1916 the population of Europe increased from 180 millions to 460 millions, and at the same time stocked with a new race the Americas, Australia and South Africa. In some countries of Europe, particularly those in which the Industrial Revolution made little headway, like Italy and Russia, the population kept well up with the increase in per-capita productivity, with the result that the standard of living gained but little, and long ago an acute population pressure set in. In others, such as England and Germany, an ever-increasing efficiency in production kept the population pressure from being felt.

This much discussion of population growth is introduced at this point—the whole subject will be discussed more in detail in Part Six—in order that we may see how it becomes a major cause of economic disturbance in the world, one of the most important of the reasons that economic society is dynamic. The very existence

[1] Assuming a given state of the arts of production. See Part Six for further discussion on this point.

of population pressure itself is an incentive to social action. It causes nations to put forth effort to increase their food supply and to improve the efficiency of their production. It causes the migration of people from one country to another, and the adoption of measures to check this migration. And lastly, it causes international struggle for economic advantage, breaking forth occasionally into open warfare. The real enemy of the dove of peace, writes the sociologist E. A. Ross, is not the eagle of conquest, but the stork.

While the growth of population on the one hand is causing population pressure in some parts of the world, in others it is opening up new supplies of food, clothing, metals, fuel and timber, furnishing new hands to be supplied with tools, new bodies to be fed and clothed. To handle these new products, and fill these growing needs, new cities are growing up and new railroads are being built.

Important economic disturbances often result from such biological phenomena as epidemics of plant pests and diseases, and of human and animal diseases. The Black Death of 1348–9 in England is the classic example of human epidemics. It is commonly said to have killed off one-third to one-half of the population, and to have laid the foundation for the Peasants' Revolution in 1381, and the eventual breakdown of the manor. In our own South to-day, the cotton boll weevil is producing disturbances which ramify to England, where much of the cotton is made into cloth, and even to the British colonies, which are trying to fill the threatened gap in the cotton supply. Rust disease in the spring wheat region of North America has seriously disturbed the wheat acreage of the world in the last ten years. These diseases and pests seem to have their day, and then subside to reappear in strength later. Their course of action when they appear can be foretold at times, but not the day of their coming. It is known that some of them have natural enemies which most of the time keep them in check; but why at certain times do they multiply faster than their enemies?

The account of biological influences producing social changes would be incomplete without some reference to the changes which inhere in the process of heredity itself. While it is true that "like reproduces like," it is never exactly alike. Some of the offspring resemble one parent; some the other; some both; some neither, but instead some near or remote grandparent or great-uncle or aunt. And none ever exactly resembles any one forebear. Two im-

portant consequences grow from this. One is that a great variety of combinations of qualities and characteristics is constantly cast upon the world to be tried out as to fitness to survive and adaptability to the changing physical and social environment. It is generally assumed that the result of this process is that the fittest or best adapted survive to reproduce the race stock. There is evidence that such has actually happened in the case of plants and animals. One cannot be sure that the process is still working in the case of civilized human beings.

The other important consequence is that occasionally some unique combination of qualities appears, some genius, with power to mold the destinies of his time. The history of ancient days is too largely told, no doubt, in terms of Alexanders and Cæsars and Charlemagnes, and too little in terms of the rank and file of humanity. But the great figures must not be forgotten; in the balance of destiny, any one of them may have weighed more than all those over whom they ruled. Nor must we forget the great religious leaders, like Christ, Mohammed and Confucius; nor the great thinkers, like Plato and Aristotle, and Spencer, Kant and Voltaire. In our own very recent times, such figures as Gladstone, Bismarck, Roosevelt, Clemenceau, Lloyd George and Woodrow Wilson loom large in perspective and influence.

Not to be overlooked in analyzing the rôles played by great men is their social inheritance. Great men are made after they are born—as a result of their contacts with their environment—fully as much as when they are conceived. Were there not a dynamic world in which to be born, great men would never be the dynamic influence that they are.

Social.—The line between biological and social influences is hard to draw in the case of population growth and pressure; also in the case of the workings of inheritance. The biological and social factors vigorously interact in population growth. Social influences, such as political policies, education, propaganda and the like affect incomes, standards of living and birthrates. Death rates themselves are a composite effect of social and biological causes.

The most important single social development that has come to man in our era is probably the improvement of navigation to the point that made possible the discovery of the New World and the opening up to colonization and development of the Americas,

Asia and the East Indies, and Africa and Australia. The shock which that event gave the then civilized world has never died away. The fact of the matter is that we are still a very new world. We have a trememdous amount of wild land still to tame, mines to develop, railroads to build, cities to build. To realize the enormity of the changes still in store for us, we need only to visualize what the world of some distant future, much more static than the present world, will be like. In that time, the populations will be distributed much more evenly than now over the earth in proportion to resources; mines, if we still have them, will be more equally developed according to the richness of their deposits and their location; forests, if we still have them, will be developed in all parts of the earth in accordance with the principle of comparative advantage; transportation facilities, of whatever kind we then have, will be more nearly adequate for all portions of the earth. We are indeed far from being an old world.

Between that distant time when we are an old almost static world and the present, there will also be many scientific discoveries and inventions. Some of them may produce as profound economic disturbances as the invention of the steam engine and the dynamo. Some of them may increase the efficiency of human labor as much as did the Industrial Revolution, and we may have another great population movement. There will be improvements in varieties of plants and breeds of animals. Workers will be better trained and more productive. If all of these improvements could come gradually, and to all parts of the world at the same time, there would be no disturbances. But this is not the way of inventions and discoveries. They are not available until they are made, and when they are made they are at once available; and they are available first in the country where they are made.

We shall be extremely blessed if there are not also many wars between then and now. No event in the history of a nation produces such intense and prolonged effects as the waging of a serious war. The paying of the war debt is ordinarily the least of all the costs. It is now eight years since the armistice, and yet agriculture and industry in the United States are still out of balance.

Every presidential election, every congressional election in the United States, is a disturbing influence. Every time Congress meets, it threatens, and in some cases actually passes, legislation which affects the economic status of some industry or class of the

people. The best example of this is tariff legislation. One might reason that elections should be held only at long intervals. But the disturbances following each would then be more severe. It is better to have more frequent minor readjustments.

In the last section, attention was called to the fact that failure to understand the present, and inability to forecast the future, cause people to continue as they are. These also have the opposite effect. If the producers of apples really knew how many apple trees would be needed to meet demand at a reasonable price in the next fifty years, they would plant this many trees, and there would be stability in apple production. As it is, they under-plant for a while and then over-plant.

There still remains to mention a large number of minor disturbing factors of a social nature. One type of these is exemplified by fashions, conceived with the deliberate idea of producing a change. Another type is the vogues in art, literature, music and minor philosophies developed not by deliberate intent, but because somebody caught the public fancy for the moment.

III. THE INTERACTION OF STATIC AND DYNAMIC FACTORS

The picture which the foregoing description of the static and dynamic factors presents to us, is of a world which is essentially stable and continuous, but which is constantly in a condition of change and readjustment due to many disturbing influences, many of them so far as known entirely irregular in their appearances. Some of these disturbing influences—population growth, for example—inhere in the very continuity of world processes themselves. There is not room in a finite universe for a very large number of continuous processes—eventually they are sure to reach the end of their course or run into each other. Let us at this point examine more closely the way in which the static and dynamic influences interact.

It has been customary in this connection to say that the static factors in society have a power which is analogous to the power of inertia in the physical world, described in Newton's First Law of Motion as that property of matter by which when at rest it tends to remain so, and when in motion to continue in motion, and in the same straight line or direction, unless acted upon by some external force. Palgrave's *Dictionary of Political Economy*, speaking of custom, says, " Men continue in a state of rest or uniform motion

in a straight line, except in so far as they are led to change that state by force impressed upon them." No doubt this analogy does give a rough working basis for starting an analysis of our problem. It is hardly proper, however, to speak of men or society as being at rest. As a matter of fact, they are constantly in motion. All living things are in motion. But the motion of men and society as already pointed out is ever largely the same motion, in the same direction, or over the same path. Now any new force that impinges on a society of men thus in motion meets resistance from it. But the resistance is not such as one would meet starting in motion a train standing at rest on a track, nor yet the resistance one would meet stopping a train in motion after the steam was shut off, but rather the resistance one would meet from a train in motion under power. The reason for this is that the processes, of the social world at least, are cumulative in their effect. The longer a habit is continued, the harder it is to change. The longer that a custom persists, the harder it is to oppose. The longer men think that a certain social arrangement is right and proper, the more vigorously it must be attacked. The more years that farmers in one region grow a certain crop, or follow a certain cultural practice, the harder it is to substitute a new one. This simply means that whereas in the physical world a body acting under inertia tends to move with uniform motion, in the social world, all motion is accelerated—the longer it continues, the more momentum it acquires. As a result of this, a continuous force is required to halt a habit, a custom, a tradition, or a conventionality—otherwise it will quickly regain its lost motion; whereas a body moving under inertia, if ever retarded in its course, never recovers what it has lost. The significance of this distinction is enormous. As a result of it, ways of doing and ways of thinking are often carried so far beyond their time and fitness that all trace of their origin is lost, and they become a few more of the many anchronisms and anomalies that amuse and vex us. It is by virtue of this acceleration that the social sanction attains its great potency. New energy is constantly acquired as the practice is repeated by one person after another or transmitted downward, but even more energy as it spreads across society, taking in a larger and larger mass. To the persistency of custom is thus added mass. A custom-obsessed society thus becomes a heavy almost sullen mass, which at times is almost irresistible. It yields here and there a little, but when the pressure is moved to some new

point, all that was lost is regained. It wins out against kings and oppressors because it outlives them and is never weary and exhausted. But, on the other hand, it is blind as well as persistent. It does not recognize changes in environment. It is wilfully ignorant, refusing to be taught. Carrying practices and philosophies over into times to which they are utter strangers, it causes suffering and the hard pains of a belated readjustment.

There is a similar difference between the physical and the social in the matter of direction of motion. If a physical mass moving under inertia has its direction of motion changed, it remains changed; whereas continuous pressure must be brought to bear to keep a social mass from returning to its old direction.

It is another one of the laws of mechanics that when two or more forces are operating at the same time, the resultant is a composite of the two effects, and different from what either effect would be alone. If this statement is understood to mean continuous forces, then it can be applied to the social as well as to the physical world. If a continuous force is brought to bear directly against a habit, custom or tradition, it will either be strong enough to check it completely after overcoming its momentum, or strong enough merely to retard its acceleration, or conceivably just strong enough to check its acceleration and cause a continuous even motion. If it is brought to bear at an angle from in front, it will in addition cause a change in direction. If it is brought to bear from an angle behind, it will accelerate the motion as well as change the direction. When a custom is confronted by new and unavoidable changes, says Bagehot, that is selected which preserves most of the old—that is, some new custom is set up which is much like the old in many respects.[1] The more directly the new changes oppose the old custom, the less the new and the old custom will have in common.

There are, however, important static elements in society whose behavior cannot be described as above. Take, for example, the fixity which comes because of the durability of capital goods, because crop rotations or manufacturing methods cannot be changed in a year or two, or because contracts are made to run for a period of years, or laws or freight rates cannot be changed quickly. It has been customary to liken the behavior of such elements to that of a semi-fluid substance, like molasses, if it were not

[1] *Physics and Politics*, p. 104.

so sticky. If a dipper of water, which is highly fluid, is poured into a larger vessel of water, it produces great commotion on the surface, but very shortly this commotion dies down and the added water appears to be spread out evenly over the old surface; and if some of the water is dipped out, the hole is quickly filled by water that flows in from the surrounding surface. Not so with a semi-fluid surface—instead, the added materials slowly works out over the old surface and it is only after a relatively long period that a perfectly level new surface is established. In this case, there is no question about the ultimate readjustment—there is no continuously opposing force—it is only a matter of the time it will take to make the change, of the degree of fluidity of the substance.

Thus we say that some industries are more fluid than others—they readjust themselves more quickly. This is because they have smaller fixed investments, less fixed capital, fewer long-time contracts and the like.

Such a description fails of accuracy and completeness in one important particular. It does not take account of the action and reaction which is surely present in the social as in the physical world. The new forces that are brought to bear in the social world sometimes come with a great deal of momentum, thus producing greater effects for the moment than they are able to sustain. The result is that the force is turned back upon itself like a rubber ball thrown against a wall. Or the very delay in the response to the new force may cause the response to accumulate added strength. The new force, for example, may be an increased need for houses and apartments. Under the impetus of this need, rents rise. Because of the time that it takes to build the new houses, rents rise higher than they should. Under the stimulus of these high rents, presently more houses are built than are needed. As the result of this, rents fall again, probably only part way to their old level. Action and reaction may thus continue for some time before a perfectly calm new surface level is attained.

To relate these circumstances to our analogy of the semi-fluid—because of the slowness with which the general level of the vessel rises as more of the semi-fluid is added, more of it is added than is needed and some must be taken out again. The more non-fluidity there is, the more the excess that is likely to be added. The more fixity in the social world there is, the greater the pressure for a change that will accumulate, and the more the reaction. Because

it takes longer to get orchard fruits into bearing than small fruits, there will be greater over and under-plantings of orchard fruits than of small fruits.

Action and reaction also play their part in the case of habit, custom and tradition. Whenever the new force strikes with considerable momentum, it may bring age-old customs to a complete standstill for the moment; but in the reaction which follows, the customs may be fully equal to the task of carrying on. "Getting back to normal" after a war means in large part getting back to old customs and traditions.

The term "economic friction" has come into general use to designate the elements which make for stability and continuity in the world. It fits fairly well the kinds of fixity just described, if one does not think too hard about the action and reaction phases of it. But it does not fit the static elements of the habit and custom type.

A more useful term is "economic lag," meaning the delay in economic response to any change. It is proper even to speak of the amount of the lag, that is, the number of days, months or years that the response lags behind the stimulus. What usually happens is that some of the response comes soon, much more later, and the rest of it drags along. Thus if the price of corn were to rise to a new high level, there would be some acreage response the first year, more the second, still some the third, and probably some even at the end of ten years. The amount of lag depends upon the amount of fixity present, and the amount of habit, custom, tradition, and the like attached to any practice. These latter are more potent to produce lag than mere fixity because they are continuously opposing forces, with power to recuperate if the stimulus ceases for a moment.

But there needs to be a term to go along with lag to designate the reaction that sometimes occurs—for example, the over-planting of corn that may occur for a time. Perhaps "counter-lag" or "over-reach" will do.

IV. TYPES OF ECONOMIC MOVEMENTS

If the pressures for change in the social world could always be applied exactly right, there would never be any counter-lag. Where the case is one of overcoming fixity, the application should be gradual at first, with no momentum behind it, then steadily

strengthening, then slackening off and stopping altogether exactly at the point that will secure the desired response. To overcome a habit or custom, the procedure should be the same, except that the pressure will need to be stronger for a time and probably continue longer. In actual cases, fixity and custom are usually pretty thoroughly intermixed.

What happens, instead of the ideal dispensation just described, is that the pressures for change come and go to suit their own fancies. The dynamic elements in society, we have shown, are mostly, so far as known, without rhythm or sequence. They appear singly, in pairs and in flocks. They pull together or contrawise. They are weak or strong as the hour determines. Before a lag is halfway overcome, the stimulus may cease; perhaps a counter-stimulus will set in, or a stimulus to change at a somewhat different angle. Hence nothing is ever settled.

But in spite of all this, some types of economic movements are clearly discernible. First of these is the general long-time nonperiodic trend—commonly called *secular trend*. A movement of this kind sets in in a certain direction at a certain time because of a combination of circumstances in the world or in a particular area, and continues in this direction more or less indefinitely until a new set of circumstances develops. One cannot be sure that it will change its direction until it has actually done so. It may continue for centuries or for a few hours. As a matter of fact, the length of a trend is a purely relative matter. If one were studying in detail the behavior of the stock market in a given session, he might well speak of the general, meaning long-time, trend for the day. The important thing is that the movement has no regular period. Examples of such trends are the following: population growth, increase of land in farms, increase of land in crops, increasing output of gold over a period, declining birth rates and death rates in a country, a general rise in the price level, a general rise in the price level for a particular class of goods, increasing consumption of fresh fruit.

All the remaining types of economic movements can be put into one class as *periodic* or *cyclical*. Periodic movements are subclassified according to the length of the period and in various other ways. The simplest of all cycles is the daily cycle, which applies to many things besides light and darkness, to such things as street traffic, street-car loadings, merchandise sales, industrial accidents,

worker's fatigue. The weekly cycle is less marked, but appears unmistakable in such phenomena as retail trade, market receipts, passenger traffic, automobile accidents. The yearly cycle cuts across nearly all fields—prices, consumption, even deaths and marriages. The course of events within these cycles is different for each phenomenon—one sequence for commodity prices, another for steel production, another for car loadings, etc.

None of the remaining periodic cycles is very regular, and few if any have been entirely proved. We hear much talk of the business cycle, and cycles of production and prices and consumption for various products. The business cycle is believed by most economists to be a phenomenon closely associated with the functioning of the money and credit system of a country; by others to have a more fundamental basis in some sort of cyclical production; by still others, if it is thought to exist at all, to be the result of occasional and more or less accidental rough coincidences of similar effects. Whatever its origin, it consists of a period of rising prices and business expansion followed by a period of low prices and business stagnation, and then gradual recovery again. There is said to be a production cycle for horses of from 10 to 14 years, averaging about 11 years. This is supposed to be about the time it takes to recover from an over-expansion of production and to stock up again after a subsequent under-expansion. Production cycles of the same general nature have been mentioned for swine, beef cattle, sheep and eggs.[1]

Of more consequence than any of these irregular cycles are such catastrophic events as wars and revolutions, which start trains of events of such magnitude that they draw all other movements in with them, whose sequence of actions and reactions may not die away for a generation. In the maelstrom of a great war, business cycles, price cycles and production cycles almost entirely disappear; and from the war begins to date a new series of cycles for nearly everything.

The interrelation of war influences and important secular trends is also very interesting. Some of them are definitely reversed by major economic events such as wars. Others are merely submerged for the time being and presently are back where they would have been if the war had never happened. For example, the consumption of wheat in the United States was downward bent when

[1] *Farm Economics, Cornell University*, p. 263.

the World War came on. The downward trend has now been definitely resumed again.

If such cycles as business cycles and production cycles have definite and different lengths, there is no way in which all can have their crests and troughs together. Thus there will be a great deal of that phenomenon which in the case of sound waves of different lengths is called interference. If a number of crests accidentally come rather near together, the effect will be a more pronounced expansion than usual. The mere fact that all such cycles are of irregular length rather indicates a good deal of both interference and drawing together of crests and troughs.

It is rather easy to separate short-time periodic movements from secular trends. The shorter cycles appear to fluctuate above

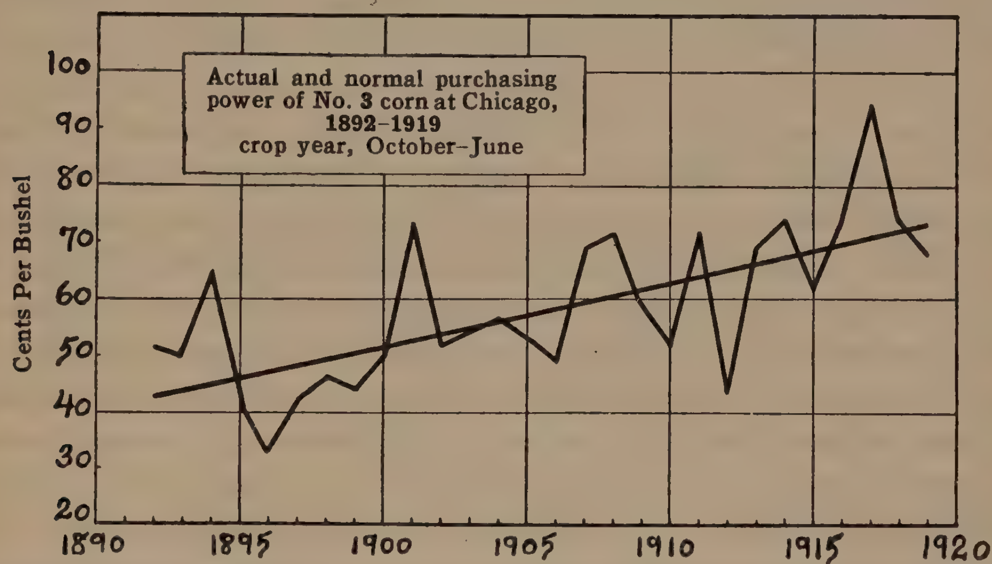


FIG. LVIII. Illustration of Secular Trend and Deviation from Trend.

and below the general line of secular trend upward or downward. Figure LVIII shows such a separation.

While all trends and cycles are themselves the result of fundamental causes, they themselves in turn become secondary causes of still other effects. Cotton production may be a contributory factor in general business prosperity; but it could never alone produce general business expansion or depression. A general business depression, however, may reduce the demand for cotton, and presently production.

After all of the changes in the world that can be have been fitted into the categories of cycles and secular trends, there still remain a vast number of them, some of them of major significance, such

as those due to earthquakes, weather, wars, famines, epidemics, important inventions and scientific discoveries; some of them of minor import, such as political events, strikes, business failures, fashions, fads, land booms—which are largely occasional and random. No complete picture of our changing social universe can therefore be presented in terms of any combinations of lines of trend, cycles and the like.

The effect of all these stimuli to change, and lags in response to them, is to give us a condition of constant maladjustment. Either of two things would be necessary to secure us a world of perfect adjustment—one a period of absolute cessation of all new stimuli to change long enough to permit all the lags and counter-lags to be overcome; the other a world of perfect fluidity, with no lags of any kind whatever, so that any new stimuli would be followed instantaneously by a complete response to it. There is some reason for believing that the world is making progress in both of these directions. Certainly as the world gets older and more settled, there will be fewer stimuli to change. We believe there will be fewer wars, famines and epidemics. The world is also becoming more fluid. All the machinery that has been developed to increase our knowledge of present and impending conditions, for communicating new information quickly to all parts of the earth, is directed solely to this end. Some of us believe that we have already reached the place where great and serious maladjustments, except those produced by world wars, are never likely to happen again. In the Old World, the world of the Middle Ages and its kind, custom and tradition were all-powerful. Even prices and wages were fixed at the customary amount. In 1817, the English economist, David Ricardo, advanced a theory of rent of land which assumed a condition of perfect competition between landlords and between tenants. Another economist, Torrens, countered by pointing out that nowhere except in England possibly, and some portions of the New World, did such conditions exist; that everywhere else the rent of land was fixed by custom. In a large part of the world of to-day, rents of land are determined mostly by competition. Prices are largely so determined. We are passing from a civilization in which fixity and custom and their kind are the most potent influences, to a civilization in which competition is the dominant condition. And this means ever greater fluidity and ever less maladjustment.

SUGGESTIONS FOR FURTHER READING

As general background material relating to the subject matter of this chapter, the reader is referred to Gabriele Tarde's *The Laws of Imitation* (1903), Chapters I and VII; to F. H. Allport's *Social Psychology* (1925), Chapter XV; to L. L. Bernard's *Instinct* (1924), Chapters II and XX; and to Walter Bagehot's *Physics and Politics* (1893), Chapters I and VI.

A brief discussion of business cycles may be found in M. T. Copeland's *Business Statistics* (1917), p. 132. The *Harvard Review of Economic Statistics* may be consulted for discussion of contemporary business changes and of factors contributing to such changes.

G. F. Warren and F. A. Pearson discuss in popular manner certain consequences of economic changes in *The Agricultural Situation* (1924), Chapters III, IV, XXVI, and XXVII.

For a treatment of the methods of analyzing economic changes, see Frederick C. Mills' *Statistical Methods* (1924), Chapters VII and VIII.

PROBLEMS

1. List those influences mentioned in this chapter which are static in character; those which are dynamic.
2. Mention at least three factors which exert both a static and dynamic influence. Illustrate each.
3. If there were no dynamic factors, would the forces of the world eventually work out so that every one would act in accordance with the various principles of production economics developed in this text?
4. It is said that economics cannot be an exact science such as physics, mathematics, etc. Do you agree? Explain.
5. Under what conditions would you find every one working at the highest-profit combination?
6. Will the tendency be for people gradually to approach the economic ideal or to depart further from it as time goes on? Explain.
7. What do you understand by "economic lag"? Illustrate.
8. What is meant by "counter-lag"? Illustrate.
9. Define "secular trend." Illustrate.
10. What is meant by a business cycle? Production cycle?
11. Will the increasing development of knowledge, education and communication increase or decrease economic lag?
12. If people had perfect knowledge would there be any cyclical movements? Secular trends?

CHAPTER XXIII

RISK AS A FACTOR IN PRODUCTION

I. THE ORIGIN OF RISK

An important consequence of the dynamic nature of economic society discussed in the last chapter is that future economic events are never altogether certain, and seldom even highly certain. The factor of *uncertainty* which is thus introduced into production gives rise to a number of its major problems.

We must understand at the outset that *uncertainty* means something more than mere change, no matter how sudden the change. It means *unexpectedness*, or *unpredictableness*, in addition. Any change no matter how adverse which could be exactly anticipated from the beginning would be reckoned with in all the plans that were made and would cause no losses. There are changes in the physical world, like the variations in the length of day and night, which are completely predictable; but few if any in the economic world. Many are predictable to a degree, and to the extent that they are, the uncertainty connected with them is reduced.

We must also understand the relationship between uncertainty and *risk*. Uncertainty is the major cause of risk; but it is not the sole cause. Uncertainty alone with respect to many economic changes would cause little trouble. If society were able to adjust itself instantaneously to all changes no matter how unexpected they were, the risk involved would be greatly if not altogether reduced in many cases. The numerous static factors described in the last chapter make quick readjustment impossible, and this greatly increases the amount of the risk involved.

The manner in which the static factors enter into the problem and augment the risk is best illustrated by the risks associated with the market. To illustrate this, let us assume a firm which for some time has been manufacturing and selling a certain brand of cotton shirts. The firm owns a factory building either especially built or especially remodeled for this purpose. The equipment of the factory is especially designed for cotton goods. Many of

the employees have worked only with these types of machines and goods. The salesmen of the firm have their established connections with the trade. It has taken a long time to build up this enterprise to its present basis. Now let us suppose that the styles in shirt goods change, that all the high school and college boys in the land become obsessed with the idea that they are not properly dressed unless they wear woolen shirts in the winter time; or that due to a cheapening of silk fabrics, accompanied by a period of full employment and high wages, more and more people take to wearing silk shirts. The members of the firm will probably not have anticipated the change and will have made up more cotton shirts than their salesmen can sell except at a sacrifice. They will also be overstocked with cotton shirt goods, which no one else would be wanting to buy from them. They will probably have to reorganize their plant and equipment and re-train their workers somewhat. They may even need to develop a new brand. There will be much about the woolen or silk fabrics and their use which the firm members themselves will have to learn. Their salesmen will need to develop a new line of selling talk.

The static factors enter into a situation such as the foregoing in two ways. The first is in the form of the period of *time* that elapses between the manufacture of the shirts and the sale of them. If the shirts were sold immediately upon their manufacture, one important element in the problem would be removed so far as the manufacturers were concerned. Unless he can contract for sales in advance of manufacture—in a manner to be discussed presently—a manufacturer must always take a chance upon being able to sell his product after it is made. The longer the period required by the production process, the greater the hazard because the greater chance that something will happen to change demand or supply conditions. The other way in which the static factors enter into the situation is in the form of the fixity of plant and equipment and of the employees and the entrepreneurs themselves as the result of their experience. This fixity, however, may also be looked upon as merely a matter of time, of the time that must elapse between the first planning of the business, building and equipping of the plant, and assembling a body of skilled workmen, and the final appearance of the product in the form desired.

These two forms of static interference with quick readjustment affect every manner of production process. The production

period for some commodities, counting only the time that the raw materials are on hand and in process, is very brief. Milk may be delivered at a creamery at seven o'clock and the butter made from it may be in tubs ready for the market long before noon. Canned fruit may be ready for the market within a day or two of the time it reaches the plant. In general, however, the production period is much longer. Pork must be processed for several weeks before it is ham and bacon; tobacco must be cured for several months before it can be made into cigars and cigarettes. Products which are seasonal must be held, either in their raw form or as semi-finished or finished products, until they are wanted by consumers. Products whose yield is uncertain, like most farm products, may need to be stored from one year to the next. Moreover, it is the whole sequence of production processes that must be considered. The cotton produced in 1926 must stand all the vicissitudes of change that may occur between the date of its planting this spring and its final sale to wearers perhaps sometime next winter, perhaps two or three years hence. Even the consumers after they buy the garments will be taking a chance that they may go out of style before they wear them out.

In one way or another, all the various static influences described in the last chapter enter into production processes and produce the sort of fixity above described and as a result stretch out the time required for a full production cycle far beyond the mere production period for the raw material itself. Habit, custom, ignorance and lethargy keep the same farmers producing a crop long after demand for it has begun to decline or overproduction has developed. Contracts of various kinds continue production for a period after it would normally cease. Needless to say, the more roundabout that production becomes, the more important will these static influences be.

This gives us the complete structure of the *risk* which is involved in production of goods for the market. First, the immediate production processes themselves consume a considerable period of time. This is especially the case if the raw materials or goods must be stored several months till the consumers are ready for them. Second, fixity of investment and other static factors stretch out the time for some parts of the production process for a much longer period. Third, during this long period, there is abundant opportunity for the various dynamic factors to upset

calculations. The crop for the year may be considerably better or poorer than the average. The winter may be very mild. A business depression may develop. Congress may convene. The Supreme Court may render a decision. Competitors may be successful in stampeding the public into a new vogue in dress or fiction or candy or breakfast food. Without the time and fixity, the uncertainty would have occasioned very little risk. Without the uncertainty, time and fixity would have occasioned no risk whatever.

From the point of view of the entrepreneur, the risks connected with the market just analyzed are the most important risks in modern production. Commonly recognized other hazards are fire, storm, burglary, breakage of plate glass windows, accident to machines and equipment (to boilers, flywheels, automobiles, etc.), damage to goods in shipment or storage, the large assortment of hazards covered by marine insurance, accident to employees, embezzlement by employees. Factory or mine or railroad operators are always faced with a strike hazard. The agricultural entrepreneur has in addition to most of the above the hazards of drouth, too much rain, frost, too cold or too warm weather, disease and pest epidemics, death or injury of live stock, failure of seeds to grow, winter-killing of crops. The outdoor amusement entrepreneur has a very great weather hazard. Another type of hazard is illustrated best by mining. The prospector drilling for iron or oil never knows in advance with a high degree of certainty what he is going to strike. Even after the ore body is located and mining is begun, there is chance that the ore body will run out at any time. Banks have another sort of hazard in the making of loans. Some of these various hazards will be discussed in detail later. With most of these latter types of risk, uncertainty alone is the most important cause. No kind of quick readjustment will save the loss that occurs when a building burns, or a ship is lost at sea. Quicker readjustment would, however, appreciably reduce the amount of risk involved in industrial accidents, crop failures and strikes.

It will be apparent that each field of production has its own special assortment of hazards. But the difference is not so much in the nature of the hazards as in the relative importance of the different types. Railroading is especially afflicted with one set of hazards; wholesaling with another.

Risk needs also to be considered from the point of view of the individual other than as a business entrepreneur. The common types of *personal* risks are accident, premature death, sickness, invalidity, unemployment, and loss of occupation. Each man working for himself, like an author, a lawyer or a farmer, has to take the usual chances of entrepreneurs of finding a market for his product or his services. The man who hires out for a wage shifts most of the risks of this kind to the entrepreneur. Under modern workmen's compensation laws, he is able even to shift some of the risks of accident and sickness to his employers. But there are many risks which must always remain personal—the risk in choosing a vocation, the risk in marriage, and the risk of mishap to members of one's family.

Lastly, every person who has any wealth of any kind has all the hazards connected with investment. These are ordinarily referred to as *capitalist's risks.* The nearest that one can come to avoiding them is to invest in government bonds. Investing in property makes one liable to all the hazards of the entrepreneur. Investing in real estate mortgages makes one liable to the risks of creditors.

Risk is therefore universal. No one is able to escape it altogether. Economics must therefore reckon with it as one of the prime facts of the socio-economic order.

II. TYPES OF RISKS AND THEIR CHARACTERISTICS

Our interest in risk in this text is from the point of view of methods of dealing with it and of organization for handling it. But before we can proceed to this phase of the subject, we need a clearer understanding of the essential characteristics of different sorts of risks. Three characteristics of any hazard are important, namely, its *controllability*, its *predictability* and its *insurability*. The third is largely an outgrowth of the other two.

Controllability.—Many losses can be avoided almost altogether merely by keeping the thing that causes the loss from happening. Fire loss can be greatly reduced by building fireproof buildings and installing automatic sprinkler systems. At the other extreme are losses such as those due to adverse weather which are subject to little or no control. An increasing number of hazards have been brought under control in the last few centuries. The frost hazard is reduced by breeding early maturing varieties, or by use of smoke

smudges; drouth hazard is reduced by supplemental irrigation; too heavy rainfall by ditching and tiling. The boll-weevil hazard for cotton is reduced by proper cropping and cultural practices; the wilt-disease hazard for flax by planting wilt-resistant varieties. Safety devices and safety education have greatly reduced accidents in factories and mines. The personal hazards of disease have been lessened considerably by the use of smallpox, typhoid and diphtheria vaccines. Public sanitation measures have lessened the disease hazard for whole communities.

Another way of controlling losses from hazards is to predict their appearance and get ready for them. This is of most importance in the case of price hazards. Those who in 1919 foresaw the on-coming business depression beginning in 1920 and trimmed their sails for it probably suffered very small losses. The controllability of hazards is therefore definitely associated with their predictability.

One of the most common situations in the business world is that of an entrepreneur planning a new undertaking. It is possible to rush recklessly into a new venture, or to weigh carefully all the chances and make a deliberate decision. There is considerable evidence that taking thought does reduce the hazard of business failure. Maintaining adequate reserves and keeping adequate records reduces the chances of failure after the business is started.

Predictability.—There are two points of view from which predictability of hazards must be considered, that of predicting the course of events in the individual case, and that of predicting it in the aggregate. Entrepreneurs are interested in both kinds. They want to know both whether the price of a given commodity is going to fall this particular June, and whether year-in and year-out it falls in June. They would like to know both whether or not a particular workman will lose his hand feeding a certain machine, and how many men in each thousand will lose a hand feeding this machine for a year. Since they cannot possibly know the former, they have to be content with the latter. In some cases, predictability is of value only for the individual case. This is true of the success and failure of individual enterprises. As to price and weather changes, it is desirable for the individual case, but still useful in the aggregate if it cannot be obtained individually.

Few if any events involving hazards can be predicted even for aggregates with *mathematical* certainty—as one can predict the

number of times in a thousand that a pair of dice will both turn up sixes at the same throw. There are always special conditions that affect the result. According to the American Life Tables, out of each thousand persons twenty years old, eight die during the year. But not every thousand persons twenty years old will have eight deaths among them each year. One of the thousands may live in the city, another in the country; one may be mostly Italians, another mostly Scandinavians; one may be mostly factory workers, another mostly college students. One year may be afflicted with an influenza epidemic and another not. Accident rates are much more variable than death rates; fire losses more variable than accident rates; and weather and storm losses far more variable than either.

A very large number of losses or changes, however, are sufficiently regular in their occurrence so that they can be predicted for aggregates with enough certainty to make predictions highly useful. This is true of deaths, accidents and fires; of weather twenty-four hours in advance, and probably a week in advance; of prices of some commodities for several months in advance and even for longer periods; of production of many commodities several months in advance and even for longer periods; of outputs per unit of most inputs, even in agriculture.

The method of procedure in all predicting is to bring together a large number of actual cases, or as many as are available, and analyze them to discover what has happened in the past, and make this the basis of judging the future. If there are many influences affecting the results, as in the case of accident rates, fire losses and the like, then either each of these disturbing influences must be measured and its past effects determined, or else a much larger number of cases must be available if the prediction is to be a safe guide to future action. To illustrate, suppose that we are getting ready to forecast accident rates. These vary by industries, by occupations and tasks within industries, by states (depending upon accident prevention laws and their administration), by nationality and other population groups, by age, by sex, by experience, and by individual plants according to type, condition of plant and equipment, lighting, management, etc. A forecast made for one task in one state for one age and sex group will require many fewer cases than one made for an industry taken as a whole; and if the forecast can be reduced to a single plant, even

fewer cases will be needed. The more accurately that the age, sex and experience of the workers can be measured, the fewer the cases that will be needed. The accident rates in actual use attempt to provide for all variations except those by individual plants. They are particularly detailed in their classification by occupations and tasks.

The principal reason that they do not provide for individual plants is that not enough accidents ordinarily happen in one plant, especially in one type of work in one plant, to furnish a safe basis for a forecast. This is also true of many highly specialized tasks engaging only a few workmen in a few plants. Each year that passes, however, adds to the number of cases and improves the basis for a forecast. A great deal of forecasting is restricted in its accuracy for reasons of this kind. Price forecasting is the best example of it. Records of price changes have not been kept for a sufficient number of years to provide an adequate sample. Moreover, it is doubtful if a record of mere price changes no matter how long kept would suffice as a basis for price forecasting. History does not repeat itself with sufficient closeness as to detail for the needs of price forecasting. What is needed is a record of all the other changes preceding or accompanying price changes that may have had a relation to it—such as changes in production, consumption, quality of product, general business conditions, imports and exports, carry-over from year to year, tariffs. Unfortunately, records of this kind have not been kept for very long for most commodities, or if they have been, they are not very accurate. Given records of this kind, for the same reasons as explained in the case of accident rates, the number of years of records needed can be greatly reduced. If all the changes relating to changes in the price of cotton for the past thirty years could be measured accurately, about as good a forecast could be made as if a hundred years' records were available. But some of the significant changes, particularly the gradual long-time changes, are not readily discernible over short periods. Under all the foregoing circumstances, few of the present price forecasts are very safe guides to future action.

Another difficulty with price and other similar types of forecasting is that many of the changes that have influenced price changes in the past cannot themselves be predicted for the future. Rainfall in July and August affects the flow of milk during this

period, and in consequence the price of fluid milk in the accompanying late summer and autumn, and the price of butter during the winter following. Once the rainfall is known, this information can be used in predicting prices for the accompanying autumn and winter. But nothing can be done in predicting the price of milk and butter for the autumn and winter of *next* year, because the rainfall of *next* July and August cannot be predicted. Similarly the forecasts of the prices of steel, petroleum, and automobiles can never include the effects of such personal factors in the problem as the actions of the great leaders in these industries. The policy of selling automobiles on the installment plan has already upset many forecasts as to volume of sales. Prices and other changes in the future, especially in the future a little distant, are predictable only in so far as they are not based upon unpredictable causes.

Finally, one must not forget that all such forecasts are of the aggregate or average future. A forecasted accident rate for a certain task is not intended to indicate that a certain number of persons in one plant will be injured in a certain year; nor a forecasted price of potatoes that potato prices will be at a certain point in March of any year. All the forecasted accident rate indicates is that given enough plants and a sufficient number of years, the accident rate will be thus and so. The forecasted potato price can be expected to be a true price only as an average for a period of years. If these forecasts are accurate, those who follow them will come out right only at the end of a sufficient period. If they are based upon an insufficient number of cases or years of experience, as is usually true of them, they probably will not come exactly right at the end of a period however long. A forecast which is reasonably accurate will come out reasonably right for exactly as large an aggregate as is necessary to make it in the first place. If records of a thousand metal lathe operators over ten years are needed to give an accurate forecast of the accident rate for this work, then the forecast based upon it will come out right only for a thousand such operators at the end of ten years. If it is accurate, however, it will fit any thousand of such operators in any ten-year period. Forecasts which are inaccurate because based upon too few cases will come out as nearly right as can be expected with as many cases as the number upon which they were based.

If the forecasts are increased in their accuracy as a result of measuring all the variables, then fewer cases are needed to make them accurate, and they will come out right with fewer cases. At the same time, they can be applied to fewer situations. Thus a forecast made for a particular task in a particular industry and state, fits only these conditions. A forecast made for a whole industry needs many cases; fits the whole industry for which it is made; but fits no part of it, no occupation or task or state within it, with any accuracy.

If not enough cases or experience are available for a statistical forecast of the usual sort, then what is called judgment must come into play. What is going to be the future of prices of radio instruments? Will they decline rapidly due to improvements in the technique of manufacture, as have automobile prices? Or will they become stabilized early at a certain level, as did phonograph prices for the most part? What is going to be the effect of installment selling upon automobile sales? What is going to be the effect any winter of late fall blight upon the keeping qualities of the potatoes in storage? The business world is confronted with forecasting problems of this kind at every turn. The method of applying judgment varies with the problem. In effect, the individual in such cases bases his conclusion upon a limited amount of experience, mostly personal, with similar or related situations. This is after all merely an informal type of statistical method applied without the use of pencil and paper.[1] If the individual's memory is good so that he has all the facts and relevant circumstances in mind, and if in his mental processes he weighs all of them accurately and thinks out all their interrelations, he will arrive at the same conclusion as if he used a pencil and paper. Business men are prone to rely altogether too much on their memories and their mental processes in such cases, and to depend upon these for many problems for which an accurate record and analysis of past experience would be much worth while and would often lead to different conclusions. But situations are constantly arising for which experience has been too limited to warrant any detailed procedure of this kind. Often the experience upon which the conclusion is based is drawn in small quantities from many different fields. Thus an employer passing upon an applicant for a position may decide that he will be industrious on the basis of

[1] Cf. C. O. Hardy, *Risk and Risk-Bearing*, p. 46.

one set of facts or experience of his own with other employees, and that he will lack initiative on the basis of an entirely different set of facts and experiences. Many problems are handled, like that of choosing a location for an enterprise, described in Chapter IX, by first breaking it up into its various phases and then forming conclusions as to each of them. The experience drawn upon may be from so remote a field that the conclusion is said to be made on the basis of an analogy.

A common type of forecasting procedure involves a combination of formal with the informal statistical method just outlined. This is illustrated in the case of accident rates. The commonly accepted rates provide for most of the different occupations and tasks, but not for the individual establishment. The accident insurance company which writes the risk makes an informal examination of the plant and its equipment and its management and on the basis of this examination forecasts the variations from the regular rates that will fit this particular plant. In common language, it uses its *judgment* in passing upon the individual establishment. In all price analysis, much judgment needs to be combined with the formal forecasts.

Insurability.—If losses or bad turns of events cannot be prevented from happening, or predicted and prepared for in advance of their happening, the only defense against them is *insurance.* The essential idea of all insurance is the payment of a small amount into a fund by each of a large number of people, out of which the few who suffer losses are paid. Not all types of hazards are well adapted to insurance. The requirements of an ideal insurance risk are as follows:

1. Not subject to control.
2. Highly predictable in the aggregate, but not in individual cases.
3. Spread over a large number of scattered cases.
4. Infrequent and rather large losses.

Insuring risks which are subject to control frequently encourages carelessness in preventing them, and in some cases even leads to intentional losses. Now that banks are insured against burglary losses, they are probably not as well defended as formerly. Insurance of crops against hail is entirely feasible because nothing can be done to increase or decrease the hazard. But insurance of crops against drouth is of rather doubtful wisdom because the care with

which the crop is planted and cultivated alters greatly the effect of the drouth. There is always danger that the grower will neglect a poor crop, preferring to collect the insurance. Since most hazards are subject to some measure of control, all forms of insurance need to be protected against neglect or carelessness. The usual method of protection is to insure for only part of the value. Buildings in the country are ordinarily insured for only three-fourths of their value, and crop insurance where practiced is even more restricted. Accident benefits to workmen are restricted to a fraction of the regular wages, and death losses from accidents are restricted in many states to one year's wages.

The more nearly predictable losses are, the easier it is to determine the insurance rate, and the less chance that an insurance company will fail as a result of writing risks at too low a rate, or make undue profits from overcharging for its services. Because accident rates are only moderately predictable, and experience is still rather limited, new insurance companies in this field frequently fail after a few years, and the insurance rates are still rather high. Marine insurance combines so many types of hazards—shipwreck, fire, theft, damage to cargo, etc.—that losses are difficult to predict. As a consequence, one large insurance company now branching out into this field recently lost several million dollars in a few years.

As a corollary to the foregoing, insurance is much easier to arrange and finance if it is spread over a large number of cases. A company writing fire insurance for ten thousand farmers can estimate its annual loss payments with much more certainty than one writing insurance for a few hundred grain elevators. In the case of fire insurance on city property, it is also desirable that the risks in any one city be carried by many companies and that each company spread its risks over many cities.

If losses occur very frequently, so that a producing unit of ordinary size is likely to have several of them each year, there is little purpose in insuring against them. It is just as easy to pay the losses each year as to pay the premiums. A merchant's risk of losses from bad debts is probably of this type; also most losses from breakage of machinery. State accident insurance laws recognize this principle when they allow large employers to carry their own accident insurance risks. If the losses are small as well as frequent, there is even less purpose in insuring against them.

III. METHODS OF HANDLING RISKS

In this section of the chapter will be briefly outlined the various methods of handling the types of risks above described. A more detailed discussion of the organization for handling several important types of risks will be found in the chapters on Financial Organization and Marketing Organization.

The logical procedure in handling risks is first of all to *eliminate them so far as possible;* then *shift what are left, so far as possible, to other agencies specializing in risk handling;* and finally to *arrange one's affairs so as to handle as advantageously as possible what still remain.* No risks can be entirely eliminated; if they could, they would not be risks. No risks can be entirely shifted to other agencies. Consequently every enterprise needs to be planned with a view to its assuming in some measures a considerable assortment of risks. This is even more true of personal risks and capitalist's risks.

Entrepreneur's Risks.—First let us consider briefly the entrepreneur's possibilities of eliminating risks. Only a few of the typical hazards will be mentioned. Fire losses can be reduced by making buildings as nearly fireproof as possible, by installing fire protection devices, by vigorously enforcing anti-smoking and other rules, by educating the employees in fire prevention. Fire drills not only prepare the employees for effective action in case of fire, but keep them thinking of the danger of fire. Lightning rods furnish considerable protection against fire on farms. In forest regions, controlled burning of brush and dead grass is a very great protection. Drouth hazards can be reduced in semiarid regions by summer fallowing in alternate years, thus storing up a supply of moisture from the previous year; by preparing the seedbed carefully, by careful cultivation, and by planting crops in such season and of such kind that they will escape the usual drouth period. Thus in regions with heavy winter rainfall and light summer rainfall—with climate of the Mediterranean type—winter wheat will generally mature before the soil becomes too dry. Barley, taking less time to mature than oats, is also grown in regions threatened with early summer drouths. Accidents can be reduced by selecting safe types of machines and equipping them with proper guards, by teaching workmen safe methods of doing their work, and by keeping them constantly reminded of specific dangers to

be avoided. Research in time and motion study, in fatigue, and in causes of specific accidents has done much to reduce accident rates. Proper lighting and proper placing of machinery are also matters of the highest importance.

Hazards of loss of market, price declines and the like can be reduced either by predicting them with some certainty and getting ready for them, or by playing very safe and taking few chances. The second course of action if followed too generally would seriously check social progress. The big individual profits from successful venturing would also disappear. Nevertheless, a greater measure of caution than is now practiced would be highly desirable both from an individual and from a social standpoint. Much work has been done in the past ten years in market and price analysis; but the actual achievement thus far is relatively not very great. Most of what has been done is best described as experimentation in methodology. The forecasts of the past ten years concerning the general price level and business conditions have been right in the large. Some of the forecasts concerning prices of particular products have probably been right if properly understood as averages for a period.

Entrepreneurs have several methods of shifting risk-bearing to others. First of all should be mentioned organizing the enterprise as a corporation with limited liability, which means in effect shifting a considerable portion of the risk to the creditors. From the point of view of the promotors of the enterprise, it means also shifting some of the risk to the other stockholders. The types of insurance companies to which risks can be shifted have already been mentioned. Insurance companies are the most highly specialized of all types of risk-bearers. At this point it should be stated that they are finding it increasingly advisable to coöperate with their policyholders in reducing losses. Accident insurance companies are even maintaining first-aid stations in the industrial districts of large cities.

There are two closely related methods of shifting the hazards of price fluctuations, one, to *hedge* in the futures market, and the other to *contract out*. Hedging will be only briefly explained at this point. Let us assume that a miller sells a carload of flour to be delivered in two months. If the miller was unable to hedge, and if the price of wheat were to rise in the meantime, he would have to sell the flour at a loss; and if the price of wheat were to fall, he would

be able to sell the flour at a profit. The miller would prefer not to take a chance on either a rise or a fall. His business is milling, and he would prefer to concentrate his efforts upon this. Since there is a futures market for wheat, he can buy in advance as well as sell in advance. He accordingly enters into a contract in this futures market to have a certain amount of wheat delivered to him at the end of two months. Since prices of wheat for delivery in various future months are regularly quoted, he knows about what his wheat is going to cost him before he makes his sales. He has thus escaped the risks of price fluctuations. But the risk of a decline in price is still in existence. Somebody must hold the wheat until the miller wants it, and take a chance upon a rise or fall in its price while he is doing it. Those who do this are called "speculators." They are specialists in assuming the risks of price fluctuations. They study market conditions closely, keep in close touch with market developments from day to day and hour to hour, and buy or sell whenever they think they see a chance of gain by so doing. Were it not for these speculators, the millers, or the terminal warehousemen who store the grain, or some type of grain merchant, or the country warehousemen who buy it in the first instance, or the farmers, would have to hold it and take the chances of the market. As it is, any one of these parties may hedge and shift the burden of risk-bearing upon the speculators. The country grain buyer can sell in the futures market as fast as he buys in the country, and the terminal warehouseman as fast as he puts grain into storage; and the miller can buy in advance as fast as he sells. *Contracting out* is like hedging except that it is not done in a regularly organized future's market. A farmer who sells his crop while it is still growing is shifting the risk to the buyer. The manufacturer who sells first and makes up his goods afterwards is shifting the risk to the buyer. The employer who makes a collective bargain with a labor union for a long period is really shifting to them the risk of price fluctuation. Buying raw materials only as needed is a manufacturer's way of shifting risks to the primary producers of them or to middlemen handling them. There is a great deal of contracting out of one kind or another in the manufacturing world.

There yet remain to be discussed the risks that are generally assumed by entrepreneurs because they can be eliminated or shifted only with great difficulty if at all. Typical among these are the

risks due to weather and price fluctuations borne by farmers, the risk of price fluctuations on stocks of goods borne by retail merchants, the risk of losses from bad debts. There is also the large number of risks, such as fire and accident, which can be only partly insured. Hedging and contracting out are very far from being perfect insurance against price fluctuations. A common method of handling such risks is to maintain reserves large enough to carry the business through any ordinary period of adversity. This is the method employed by merchants generally. Diversification is the method commonly recommended for agriculture. Yields of all crops are not likely to be low in the same year. Prices of the different farm products frequently range from high to low in one year. Crop prices may be high and live stock prices low. Accordingly the farmer who diversifies is not likely to have a mixture of all bad and all good years like the single-crop wheat or cotton farmer.

Personal Risks.—The various forms of personal insurance permit the individual to shift a great many of his risks to specialists. But ordinarily the insurance carried is not adequate to cover the losses. The amount of life insurance a person can carry is limited by his present earning power. It is when a person is young and his earning power is still small that his life is worth the most. Accident insurance is always limited relative to earning power. The commonest of all forms of shifting of personal risks is illustrated by the employer-employee relationship. The employer pays his employees a wage regularly each week and assumes all the risk of being able to dispose of the product of the labor. He provides in addition a working place and equipment. Some countries are experimenting with schemes for relieving the worker of part of the risk of unemployment. The difficulty with these schemes is that unemployment is so much subject to control by the individual affected. In general, therefore, unemployment is a personal risk that cannot be shifted, and which the individual does well to provide against by accumulating reserves. Loss of occupation from new inventions and from changing consumption habits and the like is another hazard which cannot be shifted. There is a large element of hazard in the choosing of an occupation itself, which can be only partly guarded against by careful analysis such as outlined in Chapter X. Loss of health is one of the most controllable of all hazards.

Capitalist's Risks.—Investing one's money in mortgages shifts a great deal of the risk to the mortgagor (the one who gives the mortgage on his property). The mortgagor pledges the full value of the property mortgaged for a loan represented by ordinarily less than half of its value. Investing it in bonds of a corporation is shifting it in similar measure to the corporation. The common type of bond is simply a form of mortgage. One who starts in business for himself or in a partnership, risks practically all of his property whether he uses it in the business or not. If the venture turns out badly, the creditors may attach liens to the rest of his assets. Since stockholders in corporations are liable for only their principal and interest, it is proper to say that they have shifted some of their risks to the creditors. A careful analysis of investments eliminates a good deal of the risk. Distributing one's investments widely, as between types of investments and types of enterprises, does not reduce the risk in any one investment, but it does in the aggregate.

IV. THE TREND IN RISKS

Social progress in handling risks consists in reducing them and developing better methods of carrying them. Undoubtedly the gradual progress which we are making toward a less dynamic society, one less subject to violent changes, and at the same time toward a more fluid society, is reducing the volume of risk. Risks growing out of market fluctuations are being reduced as the market is becoming better organized and better informed. The methods of science are also bringing a larger and larger number of risks under better control. Health, accident and fire hazards are the ordinary examples of this. Progress is also going to be made in predicting changes and thus forestalling their harmful effects. We are only at the threshold of progress along these lines. The most important achievement of the human race in this field thus far is the shifting of risk-bearing to specialists, particularly in the form of insurance. Life insurance is only a little over a century old. Accident insurance is only a few decades old. No doubt the future will give us new forms of insurance; but the important development will be the more general use of the forms we now have, and improvement of the technique of handling them.

SUGGESTIONS FOR FURTHER READING

The best brief accounts of the subject of risk and risk-bearing are in Henry Clay's *Economics for the General Reader* (1917), Chapter V, and Raymond Bye's *Principles of Economics* (1924), Chapter X. C. O. Hardy's *Risk and Risk Bearing* (1923), is an excellent longer treatment of the subject. All recent writers on this subject owe much to F. H. Knight's *Risk, Uncertainty and Profit* (1921). The chapters in Knight which are especially helpful for the purposes of this chapter are I, II, VII and VIII.

PROBLEMS

1. Change alone does not make uncertainty. Why? What other characteristics must be present before uncertainty arises?
2. Give an example other than those mentioned in the text of change which does not give rise to uncertainty. A change which does give rise to uncertainty.
3. Distinguish between risk and uncertainty.
4. Would risk arise if men had complete knowledge?
5. Which are the more important causes of risk, dynamic or static factors?
6. The greater use of capital goods ordinarily makes production more roundabout. Does this increase or reduce risk? Why?
7. A new process is developed. How does the question of risk enter into the decision of the entrepreneur whether to adopt the new method?
8. Business men usually have a general understanding of the business cycle. Does this assist in the reduction of risk? Explain.
9. "Risk is therefore universal." Under what condition would this statement be untrue? Would it be true for a socialist state? For a self-sufficing economy?
10. Make a list of those things which reduce risk, which increase risk; Which group is exerting the greater influence at the present time?
11. What is the difference between reducing risk and shifting risk? Illustrate.
12. It is believed that industrial accidents are fewer since the introduction of insurance. Is this due to the insurance or to other causes? Explain.
13. "Perfect foreknowledge will not eliminate risk unless the risk can be controlled." What is meant by this statement? Is it valid?
14. A constantly increasing number of risks are becoming insurable. Why is this possible?
15. In what respect is the decreasing of risks of benefit to society?

CHAPTER XXIV

THE MARKET AS COÖRDINATOR AND THE ORGANIZATION OF EXCHANGE

Before we can proceed further with our analysis of the coördination of production, we must obtain a better understanding of the way in which the market functions in this process. Enough has been said in preceding chapters to make it very clear the prices at which things are bought and sold play a large part in the organization of production. A rise in the price of a product causes new plants to be established for producing it; or starts old plants producing it in supplementary or by-product enterprises. It also causes the volume of output from plants already producing it to increase because it shifts the highest-profit combination. A decline in price has the opposite of all these effects. Changes in the prices of land, labor, raw materials, fuel, feed, fertilizer and other supplies also cause the volume of output to change because of shifting the highest-profit combination. The economic institutions which are most directly involved in those processes out of which come prices, must therefore play a major rôle in the coördination of production. The institutions directly involved in the price-making processes are known as *markets*. Each commodity has its own market, each class of labor, land, buildings and equipment; also, as we shall see later, each class of loanable funds and securities. It is customary for purposes of discussion to group these various markets under the following heads: *commodity markets*, including the markets for finished products, partly finished products, raw materials, machinery and equipment, supplies, etc; the *real estate markets*, including the markets for land and buildings of various classes; the *labor markets*, including the markets for all the various grades and types of labor, from common labor to the most highly skilled professional service; and the *money and securities markets*, including the markets for loanable funds, stocks, bonds, mortgages, etc. The distinction between the commodity markets and the real estate markets, is really the distinction between *movables* and *immovables* which

was mentioned in an earlier chapter. It is the purpose of this and particularly the two chapters following to describe the organization and functioning of these four groups of markets. But before setting forth upon this, we must further clarify our understanding of the relation between exchange and the coördination of production.

I. THE RELATION BETWEEN EXCHANGE AND COÖRDINATION

The one thing essential to a market is *exchange*. It is out of the exchanges that take place that prices come into existence. Every exchange is at a price, which is usually expressed in monetary units. But while it is true that exchange is what gives us the prices which are so important a factor in coördinating production, it is also true that if there were no exchanges, there would be very little coördinating of production to do. Each family would produce as exactly as possible the kinds and amounts of products which it needed. As soon as families began producing surpluses of some commodities for exchange for the surpluses of other families, there was danger of overproduction and underproduction. Also although exchange plays an important rôle in coördinating production, it did not come into existence for that purpose, and probably does not continue primarily for that purpose. To understand this, we will need to consider exchange for each of the four above-named groups of markets separately.

Commodities.—The earliest of all exchange to develop was probably of commodities for direct consumption between members of the same family or tribe. Exchange of tools and weapons must have taken place very early also. The first exchange between tribes was probably of food and clothing. Those living near the seashore may have exchanged a surplus of salt or salted fish with those living further inland for their surpluses of furs, nuts, and dried fruits. The reason for this trading was that these people wanted things that they could not produce themselves at home. What more obvious than that they should produce a surplus of the things which they could produce easily and offer them in exchange for the things they wanted? At a later stage in civilization, one nation might have a supply of iron and no wool, and another a supply of wool and no iron. As pointed out in Chapter V, the next stage in the evolution of exchange was when people began to see that some of the things which they were producing for themselves were also being produced by other peoples with whom

they were trading, and more than this, that they were being produced by them under more favorable circumstances, with the result that they could exchange for them and thus secure a supply with less trouble and effort than if they produced them themselves. No doubt in many cases exchange of this kind was started in years of crop failure. One people's wheat crop was caught by an untimely drouth every few years, and they made up their deficit of wheat by exchanging their surpluses of wool for it. Presently they began to realize that it was foolish for them to be trying to grow all their wheat under such unfavorable circumstances, and that it was really cheaper for them to buy it than to grow it. The advantage of trade in this case was not so obvious as when one country had iron and the other country had none; and civilization had to be a little further advanced before trade developed on this basis. But the advantage of it was none the less real, and in due time came to be appreciated.

When this stage was reached, the principle of comparative advantage as we now understand it had reached its final evolution. The basis of all exchange in the commodity markets is this principle of comparative advantage. All that was explained in Chapters V, VI, VII and VIII as to specialization by areas, by persons and by producing units, can be understood at this point as furnishing a basis for exchange of commodities. Specialization between persons is fully as important as the specialization between areas. If one person is more capable than another at a certain kind of work, say furniture making, either by natural inheritance, or because he has been taught, or has had more experience with it, he is likely to produce a surplus of it and exchange it with somebody else for the food and clothing that he needs. Specialization between persons is probably increasing in importance in modern society even more rapidly than the specialization between areas. The internal exchange that takes place in a city or village is very largely a matter of specialization by persons. There are relatively few merely physiographic reasons why an individual living in a city could not perform for himself all of the services now performed for him by his fellow city residents. As to the exchange between the city and the country, a large part of it is based upon area differences—the raw materials for the factories, the lumber for buildings, the fuel for direct consumption, and much of the food, must come from some other area; but it need not be far distant. Much of the food is

produced in the area immediately surrrounding the city and could be produced by each person for himself were it not advantageous for him to concentrate his effort on one line of work. The manufactured goods which he buys usually represent a combination of specialization by areas and by persons; that is, men specialize in making them in a region which has area advantages for it.

The rapid development of roundabout or capitalistic production has been a large factor in increasing the volume of exchange. The specialists in making tools and machines must exchange these for food, clothing and shelter. The increasing use of farm machinery has caused an increasing number of men to live in cities and specialize in manufacturing; and out of this has come an increasing volume of trade between the city and country. Breaking production into stages has also greatly increased the volume of exchange. Those engaged at each intermediate stage in the process must buy from those in the next earlier stage. Parallel with the foregoing has come the development of our modern marketing system with a number of different types of "middlemen," who for the most part are also ranked in stages, any intermediate middleman, like the wholesaler, buying his goods from another middleman just before him in the process, and selling to another coming just after him. This specialization in marketing functions has still further expanded the volume of exchange.

Every step in this increasing specialization, from the first simple exchanging of surpluses to the final exchanging between middlemen, has intensified the problem of coördination of production, has made it more possible for production and consumption to get out of alignment with each other, for too much of one product to be produced and too little of another, for too many farm machines to be produced at any time and not enough food, for one stage in the production process to turn out too large a product and another too little, for any rank of middleman to overstock with goods and another to understock. Increasing exchange has been a necessary concomitant of this increasing specialization, and hence of this increasing mal-coördination of production. And yet at the same time, the very processes of exchange have reduced the surpluses and facilitated the readjustments. If our markets were better organized, if exchanges could be arranged still more easily, there would be less mal-coördination, and that which develops would disappear more quickly. The disordered state of the world's commodity

markets was a large factor in the apparent overproduction of farm products in the period following the World War. Hence, although exchange does not owe its existence to the need of coördinating the production of commodities, it has a most important part to play in connection with it.

Real Estate.—The exchange of real estate takes such forms as transactions in farm lands, in city lots and residences, in factories and factory sites, in stores and store sites. It also includes the leasing of all of these. The essential economic difference between buying and leasing is in the period of time covered by the transaction. One who buys a piece of land buys all the future uses of it; one who rents buys its use for a specified period.

Transactions in real estate were not possible until the institution of private property in land developed. In the tribal village, the land was owned in common, that is, by all the people of the village collectively. In the medieval manorial village described in Chapter IV, a very similar condition prevailed. In general, private property in land developed gradually. Individuals first acquired certain rights in land, such as a right to pasture cattle upon it, or cut grass from it. These rights expanded until in most cases they included what we now look upon as full ownership. Or individuals bought out the rights of all the other members of the community and thus became full owners. One of the most important of the rights involved in the ownership of land is the right to sell or alienate it. This right developed rather late. In some portions of the world where progress in this direction has been slow, there are still many obstacles interfering with the free exchange of land. Even in England, many estates are so entailed with claims upon them—rights of long standing against them that have not yet been dissolved—that it is difficult to secure a clear title to them.

In general, land and buildings are considered as a unit in real estate sections. In a transfer of land, the buildings are understood to go with the land unless an agreement is made to the contrary. In modern cities, however, some land is owned separately and leased for a long term of years, usually 99 years. In timber regions, it is customary to sell the tree crop as separate from the land.

The following are some of the important reasons for the transfer of ownership of real estate:

1. Conversion from one use to another—such as of farm lands into city residence sites, of residence sites into store or factory sites, of factory buildings from the manufacture of one type of product to another.

2. Transfer to heirs upon the death of the owner. Under the law of primogeniture, the oldest son takes over the land scarcely without the formality of a transfer. Under the usual modern laws of succession, title has to be transferred just as in the case of a sale, and in many cases the property has to be sold in order to make a division of the estate. Succession in many cases takes place by a simple sale by a retiring owner to a younger man. Farm lands, stores and shops are transferred from generation to generation in this way, as often outside the family as within it.

3. In the case of houses, transfer is necessary in order to get them into the hands of those who will get the most use of them or to whose use they are best fitted. As families grow, they need larger houses. After the children leave home, a smaller house will do. A family whose income is expanding usually begins looking around for a more appropriate home. Changes in city neighborhoods, due to the encroaching of industries and the like, cause almost complete changes in ownership.

4. Real estate for productive uses has to be transferred in order to get it into the hands of those who can make the most productive use of it. A business that does not prosper is likely to be sold to someone who thinks he can do better with it. A young man who inherits a business which is beyond his capacity will eventually sell it in most cases.

Of these four reasons for transfer of real estate, the first and fourth are very closely identified with the coördination of production. Whenever production of any commodity expands or contracts to any marked degree, a great deal of real estate is transferred to new uses. Complete freedom of transfer of real estate is usually looked upon as a distinct social advantage.

Labor.—The basis of exchange of labor is the wage system. Under slavery and serfdom, the life use of the laborer was the subject of the transfer; under the wage system, the use of the laborer for a period of time. The real opposite of the wage system, however, is a system under which each person works for himself on his own little farm or his own little shop. This is more nearly approached in agriculture than in any other field of production. The Bolshevik

government of Russia has undertaken to force such a system upon its people. The reasons that such a system does not generally obtain, that some have labor to sell, and others wish to buy it, are as follows:

1. Management is needed along with labor, and most laborers are not as good managers as others to whom they can sell their labor. They therefore get more for their labor by selling it than they could get for it using it themselves.

2. Most laborers are not able to own the capital goods which they need in order to engage to advantage in modern production. They therefore find it well to sell their labor to those who have the capital goods.

3. Some tasks require such a high degree of skill that it pays individuals to concentrate upon them and let others assume the entrepreneurial responsibilities.

4. Specialization by tasks, which is so large a factor in the productivity of labor at present, has not yet been worked out successfully under any system of joint operation.

Labor, therefore, is bought and sold very freely in modern production. In many plants, labor is the largest single item of expense. In most of the rest, raw material is the only larger item. The labor market therefore plays an important rôle in the coördinating of production. Labor shifts from factory to factory, industry to industry, and even city to city, as the prices of different commodities change. The immobility of labor produces a lag in the readjustment of commodity prices. Changes in wage rates in turn become causes of readjustments in the industries.

Loanable Funds and Securities.—A market exists for loanable funds because some persons have more wealth than they care to use in enterprises under their own management, and because others do not have as much as they can use to advantage in enterprises of their own, or perhaps need temporarily in order to buy goods or services for consumption. As long as wealth is unequal, or is distributed between people differently than entrepreneurial desire and need, there will be borrowing and lending. It may be arranged by private transactions between individuals, through banks or mortgage companies, or in the form of the sale and purchase of stocks and bonds and other securities on the securities market. In the case of loanable funds, what is actually transferred is the right to use these funds for a period. In the case of

securities, the full rights of ownership are transferred. The rates at which these transfers are made determine the rate at which loanable funds are made available, and also the rate at which they flow into different uses. They thus have an active influence in the coördination of production. Further discussion of this subject will have to follow the chapter on Financial Organization.

II. WHAT IS A MARKET?

Clearly the term market as used above does not refer to a specific market place. Many commodities do not even have a place where they are regularly bought and sold. According to the accepted usage, any transaction in a commodity is in the market for that commodity no matter where it is arranged. The market for rubber includes all the transactions in rubber the world over. The scope of a market for a commodity is therefore as broad as the exchange in it—with, however, one qualification, namely, that all of the exchanges comprised in one market must have a price relationship to each other, must be part of one price system. If the price at which potatoes are sold in Ireland has no relation to the prices at which potatoes are sold in Australia, because transportation costs keep the potatoes of these two regions from ever getting into competition with each other, even indirectly, then the exchanges in potatoes in these two regions are parts of two different markets. The scope of many markets is the entire world. This is probably true of rubber, wheat, tea, coffee, cotton, silk, iron, copper and all the metals. The prices paid the native rubber gatherers in the Amazon forests, and the prices paid for automobile tires in Prairieville are no doubt considerably related to each other. Other commodities have markets which are largely world markets, but not altogether. No doubt there are many more or less isolated portions of the world which are out of the world market for meats, butter and cheese. The prices prevailing in these places will be based largely on local demand and supply conditions.

It is apparent from the foregoing that the scope of a market is a matter of social organization. The first requirement of a market is that the people included within it be in *communication* with each other so that they are aware of the sources of supply of the commodity on the one hand, and of the sources of demand on the other.

The better the means of *communication*, the better organized the market. The second requirement is that *trade channels* and

transportation facilities be arranged so that the surpluses of one area can be moved to meet the needs of the deficit area. Here again the better developed these facilities, the better organized the market. The transportability of a commodity, depending upon its perishability, and bulk and weight per unit of value, are major factors in determining whether trade and transportation facilities will be developed. Lastly, arrangements must be made for financing the exchanges between the areas, for making the payments in the first place, and in many cases for extending credit in addition. Commodities which are regularly exchanged between areas, like cotton between the United States and England, have much better communication, trade and transportation, and financing facilities developed than those which are only occasionally exchanged. The perfect market would be one in which all producers, consumers and dealers in the commodity were in constant and instantaneous communication with each other, and whose commodity was absolutely mobile. The market for wheat probably comes as close to this ideal as that for any commodity.

Within any large market organization such as that for wheat, there is a network of local organization. The term *local market* is used in two senses, to describe a market which is completely isolated from other markets, like the village markets for many commodities in the tropics; and to describe a local concentration point for exchanges within a world or other large market. Thus Minneapolis is the center of a local market for wheat within the larger world market. Also each country elevator point is the center of a local market within the Minneapolis market. Each of the local markets has its own internal organization facilities, including communication, trade channels, transportation and financing, but it also has its connections with other local markets and particularly with the larger market of which it is a part. The distinction between the two types of local markets is that one is in communication with, and at least occasionally exchanges with, the outside world, whereas the other is sufficient unto itself. The difference between the two, however, is largely a matter of degree. The market for locally grown fresh fruit and vegetables is essentially of the isolated type; and yet surpluses are occasionally exported and deficits covered by imports. The market for milk is entirely of the isolated type in some places, except as it may be influenced by the price of condensed milk; in others, it is brought

into close relation with the world market through the competition between the use of fluid milk for butter and cheese and as whole milk.

Many local markets have a definite place, such as a street or building, where most of the exchanges are arranged, and which is the center at which all the lines of communication converge. In many cases, the actual commodity is assembled here; in other cases, only samples of it are displayed; and in still other cases, it is exchanged on the basis of grade and class designations.

The peculiarities of the real estate, labor, and loanable fund and securities markets will be discussed in later sections.

III. THE MECHANISM OF EXCHANGE

We must now consider in more detail the form and structure and functioning of the market organization. The continuing growth of specialization and exchange has brought the organization of the market to a high degree of complexity. The food for our table now comes from all corners of the earth—tea from China, spices from the East Indies, dates from Persia, grapes from Spain, cocoanut from the Philippines, pineapples from Hawaii, sugar from Cuba, coffee from Brazil or Arabia. Our clothing is made from wool from Australia and Argentina, cotton from our own South, linen from Ireland or Belgium, and silk from Japan; our furniture is made of oak from Michigan, black walnut from Tennessee, mahogany from Haiti, cedar from Central America, teak from India, and bamboo from China. Necessary to such a world-wide exchange of goods is an elaborate system of physical facilities for transporting them—there must be land facilities to get them from the interior to the seaports and from the seaports to the interior again; and there must be dependable ocean transportation. Some of the commodities are perishable; hence there must be refrigeration in transit. The goods must be assembled before they are shipped and then later broken up into units of such size as to suit the needs of the consumers. Someone must look after all these activities, work out all the details, take the responsibility for them, finance them, and assume the chances of gain or loss. This means that business men must have a hand in them. Now it is conceivable that one entrepreneur could look after all the steps in such an exchange of goods—could arrange for their assembling, transporting and distributing, provide the warehouses for storing

them, the railroads and steamships for transporting them, and the local retail stores for putting them finally into the hands of the consumers. But as we have seen, it is not in the nature of production to be carried on in this way. Instead, there develops a high degree of specialization, and one type of business agency will tend to the assembling, another to the transporting, another to the warehousing, another to the financing, another to the retailing. To these various agencies it is customary to apply the term "middlemen."[1] All these agencies taken together constitute the rather elaborate mechanism commonly referred to as the *mechanism of exchange.*

A good way to get an understanding of the present marketing mechanism is to trace its evolution from its very simple form at the beginning through the increasingly complex stages up to the present.

In the beginning, when trade was first passing out of the barter stage, often there was no middleman at all. One producer simply sold to another, just as to-day one farmer who has a surplus of seed corn may sell to his neighbors. In the next stage, the producer became something of a retailer and went out into the market to sell surpluses of commodities produced with this in view. The market was usually an actual market place, like the town market in the Middle Ages, or the consumer's markets still maintained in most parts of the world, to which farmers and others bring their produce and to which consumers come to buy. Or instead the producer-retailer might load his produce in a wagon and peddle it from house to house, as many farmers do to-day with milk or garden produce. Sometimes it is not goods that are peddled in this way, but services. Until two hundred years ago, shoes in England and in our own colonies were generally made by an itinerant or journeyman shoemaker who went from house to house with his simple tools and made up the family shoes from leather furnished him by the family. Journeyman tailors similarly made up the family clothes for those who could afford to hire them made. In a slightly later stage the producer-retailer maintained a workshop to which consumers came to buy what they wanted. To begin with, the goods were made up only upon order, as in the modern tailor shop; but presently the owner of the

[1] The term middleman is generally defined, however, so as to exclude the agencies concerning themselves with the transporting and financing.

shop began to make up a supply of goods in advance and have them on hand for his customers to select from when they came. The modern roadside market very clearly fits into such a description as this. All such marketing is called *direct marketing.* A modern form of it which has not been mentioned is mail-order marketing, in which the producer establishes contacts with consumers by advertising and in various ways, and ships directly to them. Eggs, honey, maple syrup, pecans and a number of specialty products are sometimes marketed in this way.

Thus far there was no real middleman in the mechanism of exchange. In the next step, the middleman entered in the form of a *merchant retailer* who took over from the owner of the shop the responsibility for selling the goods and finding a market for them. At first, the merchant simply bought the finished goods and went out and sold them. But presently he began to furnish the raw materials needed for the goods, and then to hire the work done, frequently at a certain rate per piece. The way in which this came about may be illustrated in the case of shoes. As soon as any shop began making up shoes in advance of orders, it began looking for a larger market so that the workers in the shop could be kept busy all of the time. Improved transportation which developed about this time widened the market and made it possible to sell shoes outside of the local community. The more the market widened, the more men that were employed in any shop. This had two important effects: First, it made the selling so important a function that the owner and manager of the shop could hardly look after it properly. Or at least, it appeared presently that those who turned over this selling to somebody else found their outlets for shoes expanding more rapidly than before, and were able to keep their workmen more continuously employed. Those who did the selling, however, were in a strategic position, since they had the contacts with the customers, and presently they began to dictate terms to the handicraftsmen. Secondly, a good deal of capital was needed to provide the leather needed for the shoes. In the aggregate, considerable time intervened between the purchase of the leather and receiving the pay for the shoes. Some of the customers always asked for credit. The men who did the selling were in a better position to borrow the necessary funds than were the shoemakers.

In the next stage in the development of the mechanism of ex-

change, the modern type of retailer intervened between the merchant and the consumer. As the merchant spread his business over more and more customers, his contact with them became so slight that it lost its significance. The consumers demanded more service with the commodities they were buying. The merchant therefore became an overhead specialist looking after only the financing, and the coördinating of supply and demand and the like, having turned over to local retailers the actual selling of the goods to the final consumers. On this basis, he could handle a much larger volume of business than formerly. The sales unit was no longer one merchant retailer selling goods to two or three thousand consumers, let us say, but instead a merchant and a few score of retailers selling goods to perhaps fifty thousand consumers. The amount of capital required by a merchant was not increased so much as one would expect, because his turnover was greatly increased. The local retailer now had to carry the goods in stock and give credit to the consumers.

In the next step, the merchant became a mere wholesaler; that is, he bought the finished product from the producers and sold it to the retailers. He no longer furnished the raw materials to the manufacturer and hired the work done. The manufacturer now owned his shop, bought his raw materials, hired his labor and sold to whichever wholesaler he pleased. How the merchant lost his strategic position in the market, and the manufacturer recovered his, is too long a story to be told in detail here. It did not come about all at once. The Industrial Revolution and improvements in the technique of production no doubt had something to do with it; also the increasing scale of production that accompanied it. This method of distribution is the one which prevails to-day in the marketing of staple manufactured products such as groceries, dry-goods, hardware and the like. The wholesaler in these fields is now generally known as a jobber. If any one form of marketing organization is to be called the "standard," or "typical," or "usual" for manufactured products, it is this one, with the manufacturer selling to a jobber, the jobber selling to a retailer, and the retailer selling to the consumers.

In many lines of production to-day, however, there is a tendency to dispense with the jobber by selling direct to consumer or retailer. This makes one less type of business unit in the marketing chain, but it does not really reduce the number of types of people doing

selling; it merely substitutes salesmen employed by the manufacturer for salesmen working for themselves as independent jobbers.

This last step probably represents the present trend in the evolution of the marketing mechanism. To understand this, we will need to consider some of the associated developments. As from the beginning, the mechanism is still becoming more complex. Goods are being transported still longer distances. A greater variety of wants is still being satisfied, more services are being furnished with the goods. New features in processing, packaging, etc., are being added. New and more complex devices for financing are being developed. And all the while, advertising and the creating of demand for the product have become an increasing factor in the problem. The increasing use of brands has also had its influence. All these developments have provided a place for an increasing number of specialists. Advertising illustrates this as well as anything. Advertising agencies have been established whose sole business is to handle advertising for others. Manufacturers have their own advertising or publicity departments. Advertising work itself is specialized to the point of employing separate staffs of writers, artists, engineers and salesmen. But while the number of specialists has been increasing, the number of types of independent marketing business units handling manufactured products has probably been decreased for many lines of foods. More and more of the specialists are being employed by the manufacturer. This is true even of the advertising specialists. The increasing scale of production is making it possible for more manufacturers to have their own sales and advertising forces.

The foregoing is a brief account of the development and present condition of the mechanism for the exchange of manufactured goods. A similar account could be given for various types of agricultural products, and for the bulky raw materials of manufacturing such as coal, iron and lumber. The mechanism would be found to be fully as complicated; in some cases, more so. Certain new types of middlemen agencies would have to be mentioned, particularly the commission merchants and the brokers, and the commodity exchanges in which these men frequently operate.

Nothing has been said thus far about the mechanism of interna-

tional exchange. This usually includes several additional middlemen interposed between the producers in one country and the consumers in the other, chief of whom are the commission houses, which buy on commission in a foreign market for domestic merchants, jobbers, known commonly as "export merchants," who specialize in international trade, buying in one country and selling in another, and the manufacturers' agents, who operate in the foreign market, handling on a commission basis the selling and collecting for a number of manufacturers in the exporting countries.

The mechanism for the exchange of real estate, labor and loanable funds and securities will be discussed in the chapter on Marketing Organization. No amount of social evolution can ever interpose as much distance or as many middlemen between the buyers and sellers of real estate and of labor as in the case of the commodities. The loan markets and the securities markets, however, are become rather highly organized.

IV. THE RÔLE OF MONEY IN THE MECHANISM OF EXCHANGE

It is easy to see why exchange of goods did not develop very far until money was introduced. Bartering required that two people got together each of whom had a commodity which the other was willing to take, and also that the values of the two commodities were such that some sort of an even trade could be figured out. If the exchange was of salt for nuts, equality in values could be secured by adjusting the quantities of the two commodities; if it was of furs for a canoe, perhaps by adjusting the number of furs given for one canoe; but if it was of a canoe for a weapon probably no such adjustment could be made. After money came into use, all that was necessary was to find someone who had the "cash" and was willing to buy. Differences in values could also be made up in cash. When goods could be sold for cash at almost any time, men were willing to buy them and hold them in anticipation of sale at an advance. Thus the middleman became a possibility.

It would be misleading, however, to think of the early moneys as "cash." Many strange things have served as money in their time; salt, tea, tobacco, furs, beads, and ivory are the classical examples. Mark Twain makes his inimitable "*Eskimo Romance*" center around fishhooks as money. Even cattle and sheep have been used as media of exchange. Most of these things became money

because they had a ready foreign market. This made them generally acceptable in exchange. Sometimes these same things became the money of the importing countries because they were generally acceptable there. There was always a tendency for articles or commodities of high value, such as ivory or salt, to be used as money.

In due time the metals came to be selected as being best suited to serve as money, first, the more common metals, such as iron and copper, and later the precious metals, such as gold and silver. As trade between countries developed, some form of money was needed which would be acceptable almost anywhere and would be equally in demand almost anywhere. Obviously such things as salt, tea and furs would not qualify in this description. As civilization progressed, more and more of the peoples of the earth had use for the metals. This was particularly true of the more precious metals.

There were also other reasons why the precious metals came to be generally used as money; but before we can understand them, we must have a clearer notion of the functions of money. The medium-of-exchange function is the one which we have stressed thus far. No less important, and closely identified with this, is its function as a *measure of value*, a "common denominator of value." Just as soon as people began to exchange things commonly for one commodity, they began also to speak of the relative worth of them in terms of this commodity. A fur was worth five measures of salt; a spear worth ten measures of salt. Thus a spear was twice as valuable as a fur. A third function of money is as a *storehouse of value*. Men do not always want to spend their money as soon as they receive it. They may want to lay it aside till a time when they need it more. That time may be many years off. A good money must therefore be something which will keep. It must keep its value as well as its physical condition. A commodity whose value may fall a half in a year makes a poor storehouse of value. This same quality is necessary for the fourth function of money, namely, as a *standard of deferred payments*, which we can not understand fully until we know something more about *credit*. Let it be enough to say at this point that credit requires paying back at some future time, and hence some common measure or standard in terms of which to express the amount of the loan both when it is made and again when it is paid back. A commodity

whose value fluctuates therefore makes a poor standard of deferred payments.

The requirements of a good money should now be readily apparent. To be a good medium of exchange, it must be generally acceptable, must have high value (but not too high) in proportion to its weight and bulk, must be durable and stable in value, must be divisible into units of varying sizes, and must be easily recognizable. Gold and silver qualify under all of these heads, except that gold is of too high value to make suitable coins of small denominations such as a dollar or less. Accordingly the cheaper metals are used for small coins. Silver, on the other hand, is too bulky for the larger denominations, with the result that silver dollars are now surely passing out of general use in this country. Coins which are not easily recognizable are readily counterfeited. To be good measure of value, a money must be in world-wide demand and be fairly stable in value. To be a good storehouse of value, a money must be highly imperishable, occupy not too much space, and fluctuate in value as little as possible over long periods of time. Stability in value is also the prime requisite for a good standard of deferred payments. No important commodity in existence has as stable a value as gold. The principal reasons for this are its high value, which keeps it out of too general use, the extreme slowness with which new supplies of it are added, and its durability, giving us a large stock at any time even though new supplies come slowly. But in spite of these circumstances, the value of gold fluctuates much more than we could wish it. Hence, although gold makes our best money at present, it is far from being a perfect material for this purpose.

Before any good system of moneys could come into general use, some form of public authority had to take a hand in it. Public authority has determined what the coins shall be, how much gold or silver they shall contain, how much money shall be coined at any time, has, in fact, taken over the whole function of coinage. Usually some metal, either gold or silver, has been declared to be *standard money*, and some quantity of this is put into a standard money unit. The standard unit in our currency system is the dollar, weighing 25.8 grains and containing 23.22 grains of fine gold.

Modern states also use a great deal of paper money. In ordinary times, this paper money is *convertible*, that is, it will be redeemed

in gold at any mint or government depository. One reason for issuing paper money is that gold and silver are bulky to carry about. Another is that gold coins wear light in use. Several kinds of paper money are issued in the United States. The *gold and silver certificates* are backed up by an equal amount of gold and silver coin or bullion kept on reserve in the national treasury. They are sent out into circulation to take the place of the actual gold and silver. *Government notes*, on the other hand, are not backed up by an equal amount of coin or bullion in the treasury. The government agrees to redeem them on demand of the bearer, but does not expect all of them to be presented for redemption at once, and so keeps only a part of the necessary reserve on hand. The government notes of the United States are known as "United States Notes." In the United States, the power to issue *bank notes* is in effect limited to national banks, and these are required to purchase government bonds to the full amount of such issuances, and to keep in addition a 5-per cent gold redemption fund on hand in the national treasury. The *Federal Reserve Bank Notes* are issued by the twelve banks in the Federal Reserve System under similar restrictions. The *Federal Reserve Notes*, also issued by the Federal Reserve Banks, are secured by a 40-per cent gold redemption fund maintained by these banks, and also by outstanding loans to borrowers from banks in their districts. When these loans are paid, the notes must either be retired or else secured by a 100-per cent redemption fund. *Inconvertible* paper money is money issued by a government with the expectation of being able to redeem it at some future date, or which a government declares itself unable to redeem after it has issued it. Nations at war sometimes resort to issuing inconvertible paper money as a means of raising money. The effects of such a policy in Europe to-day are all too apparent. As more and more inconvertible paper money is issued, the more and more it depreciates in value, until finally as in Russia, and in Germany recently, it has no value whatever. The French franc is now exchanging at about one-seventh its pre-war value.

The development of monetary systems has closely paralleled the development of specialization and exchange. No doubt exchange would have developed more rapidly at many periods in history if monetary systems had been more adequate. This is particularly true of trade between nations. The recent breakdown of

several European monetary systems has crippled domestic industry greatly. The farmers of Russia have been paying their taxes in wheat and other produce.

Without money, the wage system would never have developed very far. Money first played its part in the labor market when the peasants of Europe began to " commute " their services to the manor lords, that is, substitute money payments for them. With the growth of independent farming, either as tenants or freeholders of the land, and also independent shopkeeping, more and more people began to work for wages, and to receive more and more of their wages in cash. Agricultural laborers still receive a good share of their wages " in kind," that is, in the form of produce, in many parts of Europe and Asia. Factory labor has been paid money wages mostly from the beginning.

The exchange of real estate is facilitated by money because money furnishes a much needed measure of value for it and because money permits the sale of it for cash. This means that persons can buy it who have no other real estate or large personal property possessions to exchange for it. Money also makes possible the renting of land and other real estate for cash. This makes it easier for one man to own the real estate and another to use it, an arrangement which means a great deal to agriculture especially. Before money came into general use, the usual systems of renting land required paying the rent as a share of the product, or sometimes as a definite amount of product. Share renting is still very common, but the landlord usually takes his share as a portion of the cash proceeds.

Paper money in a currency system adds a desirable quality to it not previously mentioned, namely, the quality of elasticity. The volume of goods exchanging varies greatly from year to year and particularly from season to season during the year. The moving of the crops in the fall of the year causes a peak-load demand for money at that time. A strictly metallic currency could not be expanded to meet this demand. If enough money is kept in circulation constantly to handle the peak-load demand, a number of unfortunate consequences enter which cannot be explained here. Paper money, in theory at least, can be issued and retired almost at will, and hence by means of it the volume of the circulating medium can be kept somewhere nearly adjusted to current needs.

V. THE RÔLE OF CREDIT IN THE MECHANISM OF EXCHANGE

A large volume of exchanging of goods, even between nations, is possible with no more of a monetary system than has already been described. Trading under such circumstances would all be for cash. If goods were shipped to a foreign country, gold or silver would have to be shipped back in exchange. The need for something more than cash trading was early recognized. Even in the barter stage, people sometimes wanted things when they did not have anything to offer in exchange at the time and the seller was willing to wait till the buyer had something to pay him with later, that is, to grant him *credit*, or accept a *promise to pay at some future time in exchange for an immediate delivery.* With the introduction of money, the amount promised to be paid was expressed as so much money. When people wanted things and could not pay for them, they said that they did not have the money just then. If there was a reasonable expectation that the buyer would have the money some time in the future, either as a result of earning it, or of having something to sell, and if the seller could get along without immediate payment, then a credit arrangement could be made. Such arrangements were very early reduced to written form. The credit instrument used in a simple case such as the foregoing was called a *promissory note.* Sometimes the period of the loan was only a few months, long enough to give a crop a chance to mature; sometimes for several years, long enough to give a piece of land or a building a chance to pay for itself.

Now it often happened that the party having the goods to sell needed the money himself and could not give credit, but in the same community were men who had more money on hand than they needed at the time. These were the so-called rich men of the town. Hence a practice developed of going to such men and borrowing from them the money with which to pay the party who had the goods to sell. Because it was in many cases a great advantage to have money *now* rather than later, men were willing to pay for this privilege. This price paid for the privilege came to be called *interest.* Thus the professional money-lender came into existence, a man who regularly loaned money for a consideration. Whenever people needed money for any purpose, or saw an opportunity of gain from the use of money if they had it,

they sought out a money-lender. The paying of interest was called *usury* in the beginning, and objected to by the church; but the economic advantages of such an arrangement soon came to prevail.

In the next stage of development of credit, the professional money-lender began to loan other people's money as well as his own. He had more calls for money than he could meet, and like Shylock in the *Merchant of Venice*, he began arranging loans for his friends. Presently people brought their money to him to be loaned. As a next step, the money-lenders began acting as regular middlemen, accepting other people's money at a certain rate of interest, and lending it out at a higher rate of interest, but assuming all responsibility for the safety of the loan and looking after all the collecting. This step, however, was not really taken in most places until some other developments had occurred. During this time, certain other functions in connection with money had become increasingly important. Foreign trade as then carried on involved a good deal of actual exchanging of moneys of different countries. Goods from foreign countries were frequently brought in and sold by foreign traders themselves. Even in one country, there was likely to be a considerable assortment of currency. Small countries frequently had no currencies of their own and used a mixture of the coins of all their neighbors. The business of coinage was not as well standardized as at present. Sovereigns sometimes resorted to the device of debasing new issues of money in order to realize a profit from it. Coins were frequently "clipped" or mutilated in various ways. The business of "money-changing" therefore developed. The men who did this had to be specialists in gold and silver. Hence the business drifted into the hands of the goldsmiths. There was also need for places of safekeeping for money. The goldsmiths and money-changers had to have safety deposits for their stocks of gold and money. Hence they gradually took on the practice of accepting deposits of currency for safekeeping. The money-changers frequently had surplus money of their own to lend at interest, and this became a regular part of their business. Presently they also began loaning some of the money they had in safekeeping, taking a chance that not all the depositors would call for their money at one time. The opportunity to do this put the goldsmith money-changers in an especially favorable position to do the lending. They could

loan money at lower rates of interest than other people. Hence the business of money lending gradually drifted into their hands. When this combination was made, the modern commercial bank was born.

The first institutions to bear the name of banks were established in Italy and in Amsterdam, but these were not regular banking institutions, since they did not lend money. The first deposit banks in Italy were established by private bankers in the 14th century, and the first public bank established was the Banco di Rialto. This institution was chartered in 1587 primarily because of the frequent failure of the private banks. In 1619, the Banco del Giro was chartered. This bank became widely known as the Bank of Venice. It had no capital stock and was purely a bank of deposit. It charged a small fee for the safekeeping of the deposits and arranged to transfer accounts on its books upon the order of its depositors. It was not a lending bank and was supposed to have bullion on hand to the amount of its deposits; but government loans caused it to suspend payment at various times. It finally closed in 1797 at the time of the French invasion. It was of great service in its time to commerce, both foreign and domestic. The Bank of Amsterdam was organized in 1609. It was established primarily to furnish merchants with a medium of exchange which did not fluctuate in value as did the money which was ordinarily in circulation. It did this by issuing bank money secured by a bullion reserve. It issued this money in exchange for the current coins which it accepted according to their bullion content and not according to their nominal value. A small charge was made for this service. The bank money was redeemable in bullion under certain conditions and the redeemability was guaranteed by the City of Amsterdam. The bank was not supposed to make loans, but late in the 18th century the bank become insolvent because of loans made to the provinces of Holland and West Friesland, the Dutch East India Company and the City of Amsterdam.

The banking business in England grew up among the goldsmiths on Lombard Street in the 16th and 17th centuries. The goldsmiths had earlier migrated from Lombardy in the continent, at that time the heart of the trade center of the world, where the business of money-changing was most active. Presently the goldsmith part of the business was dropped, and receiving de-

posits and making loans and changing money became almost their sole activities. The Bank of England was founded in 1693 for the immediate purpose of negotiating a loan to the king to help him carry on his war with France. But it very soon was doing a general banking business, accepting deposits and making loans.

Banks have since taken upon themselves several additional services which greatly facilitate trade. One of these is to carry checking accounts. Another is to assist in forwarding payments to sellers or to creditors in other places by means of drafts. This is handled in such a way as to save most of the actual transfer of currency. Even buying and selling between countries is handled with little transfer of currency. The manner of arranging this will be discussed in a later chapter. Without all these modern credit facilities, the present free exchange of goods between countries, and even between parts of the same countries, would be greatly restricted.

Credit has played its rôle in the labor market by making it possible for entrepreneurs to borrow money with which to pay the wages of workmen before the goods are sold. A very large part of production to-day is financed on this basis. Even farmers borrow a great deal of money to pay wages with.

The principal contribution of credit to the real estate market has been to enable people to own and operate land and other real estate who do not have enough resources to own it in full. Over 40 per cent of the owner-operated farms of the United States were mortgaged in 1920, and the mortgages represented 29 per cent of their value. In the cities, there is a tremendous volume of buying of homes under mortgages, installment contracts and other credit arrangements.

VI. THE VOLUME OF EXCHANGE

The total bank debits in the United States furnish a rough index of the volume of exchange. In 1924 this figure was $491,690,000,000. It is estimated that 80 to 90 per cent of the financial transactions are now carried on by checks or other debit items. Perhaps the total exchange of the country would amount to over five hundred billion dollars if all items could be tabulated. Such a figure is much larger than the value of the annual production, because in the ordinary course of exchange, many commodities

are sold several times. The value of manufactured products in 1923 was $60,556,000,000. This figure would be included several times in the total figure included above. It would enter into the total when the raw products were first sold to dealers and again when the dealers sold them to the manufacturers. The wage bill of these manufacturers for 1924 was somewhat in excess of eleven billion dollars. The value of farm products for the same year was about twelve and a half billion dollars; of mining products, over five billion dollars; of transportation services, one billion dollars; and of food products (manufactured), five billion dollars. The volume of capital flotations (stocks and bonds, both new and refunding issues) amounted to more than six billion dollars. These data serve as an indication of the vastness of the exchange transactions carried on in a single nation, and show to a certain degree the magnitude of the organization necessary to transact business.

SUGGESTIONS FOR FURTHER READING

Clive Day's *History of Commerce* (1917), particularly Chapters V, VI, VIII and XIII, presents the historical development of markets and marketing. The evolution of markets and marketing institutions is discussed by N. S. B. Gras' *The Evolution of the English Corn Market* (1915), and R. B. Westerfield's *Middlemen in English Business* (1915), Introduction and Chapter VII. A briefer account of the early markets is found in various sections of Chapters IV and V of N. S. B. Gras' *Introduction to Economic History* (1922).

For additional discussions of the evolution and functioning of money in our exchange economy, the following treatises may be consulted: F. W. Taussig's *Principles of Economics* (1921), Chapters 17, 19 and 23; Raymond T. Bye's *Principles of Economics* (1924), Chapter XI; and R. T. Ely's *Outlines of Economics* (1919), Chapters XIV and XV.

PROBLEMS

1. Write a definition of a market.
2. In the industrial stage where each family is self-sufficing, overproduction is not possible. Why?
3. Only when people begin producing a surplus for exchange is there danger of over-production. Why?
4. In what way does the market assist in regulating production?
5. Could you consider the development of markets to be merely a result of the working out of the principle of comparative advantage? Explain.
6. Would it be possible to secure the benefits of the principle of comparative advantage without organized exchange?

7. What was the original purpose of exchange?
8. How does the real estate market assist in the working out of the principle of comparative advantage? the labor market? the securities market?
9. In what way does the improvement of the market decrease the immobility of the elements of production?
10. What is the aim of all exchange?
11. What are the functions of money? What constitutes a good money?
12. Prepare a table comparing the qualities of gold, lead and platinum which would make these metals a good or bad standard of money. Which is the best?
13. How could governments profit by debasing their currencies?
14. Would it be possible to carry on exchange in its present volume without the use of credit instruments, *i. e.* by using only "hand" money?

CHAPTER XXV

FINANCIAL ORGANIZATION

It is not the objective of this chapter to give the student a full account of the financial organization of society. That is a subject for a whole course in itself. Any student who takes more work in economics is sure to include a course in this field. Only so much of an outline of the subject is presented here as is necessary as a foundation for the later chapters.

The general outlines of the financial organization of any country must be about as follows: First, there is the governmental machinery for coining money and issuing paper currency and for keeping control of this. Then there is the vast commercial banking system of the country, with the small local banks at the bottom, and larger and larger banks in the cities pyramided upon these, the whole structure culminating either in one central bank under government control, as in England and Germany, or in a number of such banks under state control, as in the United States. The functions of banking, particularly the major function of extending credit, are so identified with the function of currency control that governments must take an active hand in the affairs of the banking system. The joint functioning of the governments and the international bankers provides the mechanism of exchanging payments and settling balances between countries. Then there are several other types of credit and financial institutions which render special services included in or closely related to the foregoing. Chief of these are mortgage companies, the insurance companies, trust companies, savings banks, commercial paper houses, cattle loan companies, and building and loan associations. All of these various credit and financial agencies constitute the mechanism of the loan or "money" market, with which is closely associated the stock and bond market with its own set of special agencies, including the brokers, the investment banks, and many small dealers, and the "stock exchange."

THE CURRENCY SYSTEM

The coining of metallic currency has become a government function in all parts of the world. This has been found necessary in order to insure that the coins be all of standard weight and purity. In addition, rigorous regulation and policing is necessary in order to prevent counterfeiting and fraudulent removal of metal from coins by " clipping " or " sweating." Coins which wear light from use, after they reach a certain minimum, are no longer necessarily accepted in payment of debts or of obligations to the government. In the United States, the loss falls upon the last holders. The three mints of the United States are located at Philadelphia, Denver and San Francisco. In addition, assay offices where gold bullion can be exchanged for currency are maintained at eight other points.

An important distinction is that between *standard* and other money. Standard money is that money in terms of which all other values are measured, even the value of other currency. A large part of the world once used both gold and silver as standard money. This arrangement caused trouble whenever the ratio between the commercial values of the two metals changed. Just as soon as one of the metals became cheaper than the other, people began to pay their bills with the cheaper money and the other disappeared from circulation. As a matter of fact, it was usually shipped out of the country, being used in payment of foreign obligations, which are always settled according to the commercial value of the metals. After much difficulty of this kind, the United States stopped the coinage of silver dollars in 1873. Popular pressure from the West forced a limited coinage of silver again after 1878. The Democratic party made the free and unlimited coinage of silver in the ratio of 16 to 1 (16 ounces of silver equal in value to 1 ounce of gold), the principal point in its platform in the campaign of 1896 and very nearly carried the election. In 1900, Congress definitely adopted the gold standard. England had done so in 1816, Portugal in 1854, and Germany, France, Belgium, Italy, Norway, Sweden, Denmark, Spain and Austria Hungary one after another in the decade of the seventies. Japan and Russia adopted it in 1898 and 1899. By 1915, due largely to the decreasing use of silver for coins, 39.89 ounces of silver were required to buy an ounce of gold. The silver and other minor coins of the

United States are all worth less as bullion than as coins. They are maintained at their nominal value by the government's promise to redeem them in gold. The government regulates its issues of the various coins according to the needs of exchange.

The paper currency of the United States is issued both by the government and by the national banks, including the Federal Reserve Banks. Table XXXIV shows the relative proportions of the different forms of paper currency in circulation in the United States on *June 30, 1925*. All these forms of paper currency have already been described except the "Treasury Notes of 1890," a special form of United States note issued in 1890, now being retired as rapidly as they reach the Treasury. The gold and silver held in the Treasury as redemption fund for the gold and silver certificates, is reported in the table as gold and silver certificates. Of this huge volume of currency, only 4.4 per cent in 1925 was held in the United States Treasury as assets. But an additional 38.0 per cent was held by or for the Federal Reserve Banks and the Federal Reserve Agents. Of the remainder, 11.4 per cent was held by national banks and others reporting to the Comptroller of the

TABLE XXXIV. RELATIVE PROPORTIONS OF THE DIFFERENT FORMS OF CURRENCY IN CIRCULATION IN THE UNITED STATES, JUNE 30, 1925. (ADAPTED FROM REPORT OF COMPTROLLER OF THE CURRENCY, 1925, p. 109)

Kinds of money	*Stock of money* [1]	*Per cent of Total*
Gold coin and bullion	$4,386,195,841 [2]	53.
Gold certificates	(1,609,687,619) [3]	(19.6)
Standard silver dollars	522,061,078	6.
Silver certificates	(448,724,195) [3]	(5.5)
Treasury notes of 1890	(1,386,882) [3]	(0.2)
Subsidiary silver	283,471,971	3.
United States notes	346,681,016	4.
Federal reserve notes	1,942,239,530	24.
Federal reserve bank notes	7,176,033	1.
National bank notes	733,366,074	9.
Total, July 1, 1925	$8,221,191,543	100.

[1] Includes United States paper currency in circulation in foreign countries and the amount held by the Cuban Agencies of the Federal Reserve Banks.

[2] Does not include gold bullion or foreign coin outside of vaults of the Treasury, Federal Reserve Banks, and Federal Reserve Agents.

[3] These amounts are not included in the total since the money held in trust against gold and silver certificates and Treasury Notes of 1890 is included under gold coin and bullion and standard silver dollars.

Currency. The balance, 46.2 per cent, was carried in cash registers and safes of merchants and manufacturers and the purses of our 116,000,000 people. A small percentage included in this last figure was in the vaults of private bankers and other banking institutions which did not report to the Comptroller.[1]

II. THE COMMERCIAL BANKING SYSTEM

Banks are roughly classified as commercial banks, investment banks, trust companies and savings banks. To understand the difference between these different classes of banks, one must know the different kinds of credit. The usual classification distinguishes between *investment* credit, *commercial* credit, and *consumptive* credit. Investment credit is fixed-capital credit. It is credit used in securing the plant and equipment needed in order to start a business, or buy one already going. Investment credit is necessarily *long-time* credit. Plant and equipment are used up slowly in the production process. Hence it is only after several years that enough value has been taken out of them to repay the loan. *Commercial* credit is *working-capital* credit. It is used in financing the current operations of a going business, in hiring labor and buying raw materials and supplies. Such credit is *short-time* credit. The loans can be repaid as soon as the goods are manufactured and sold. *Consumptive* credit is credit used in buying final goods ready for consumption, such as pleasure automobiles, pianos, dress suits. Investment loans and commercial loans are said to be self-liquidating, that is, they repay themselves in due time—investment loans slowly, commercial loans rather quickly. Loans purely for consumptive purposes are not self-liquidating at all. If they are paid, it must be out of means obtained from other sources. Such loans are therefore not considered desirable from a banking point of view and are usually made for short periods. On the basis of the period of the loan, some credit is classified as *intermediate*, that is, coming between short-time and long-time credit. The upper limit for short-time loans is six months, and mortgages and the other usual types of investment securities do not generally run for shorter periods than three years. Agriculture especially has need for credit for a period between these two limits, either for maturing live stock with a long growing period, or for carrying crops over to the next year if the market is glutted.

[1] *Report of Comptroller of the Currency*, 1925, p. 108.

A very important distinction is that between *bank credit* and other credit. To appreciate this, one needs to understand the fundamental basis of the banking business. A private individual who has $50,000 to lend is all through when he has loaned this amount. But if the individual will deposit the $50,000 in cash in a bank, the banking system as a whole can loan several times this amount. The bank receiving it can safely loan out considerably more than the cash deposit because the borrowers usually take their loan in the form of deposit credit and it is only later when the checks drawn by the borrower begin to come in that the bank actually has to pay out its cash. The actual cash payments are mostly to the other banks to whom most of the checks are presented for payment. If the checks are presented to the bank itself, the owner of them usually takes deposit credit for them, which leaves the cash reserve of the bank unchanged for the time being. But the bank in question is in turn constantly receiving checks drawn upon other banks, and receiving cash from these other banks in payment therefor, which adds to its reserves. Thus the cash deposits which other banks receive come to add to the cash reserves of the bank we are discussing. The payments which this bank makes to other banks add to their cash reserves. Thus the original $50,000 cash deposit comes to contribute to the reserves of many banks, and the deposits of all other banks to the one in question. Professor C. A. Phillips has determined that the most that the bank receiving the deposit can loan in excess of it is about 10 per cent, but that all the banks in the system can loan ten times the amount of the deposit.[1] In the accompanying simplified bank statement the "loans and discounts" are nearly as large as the "deposits"; and deposits are several times as large as "cash on hand." This is the usual condition of bank statements.

Resources		*Liabilities*	
Loans and discounts	$715,000	Capital stock	$100,000
Bonds and securities	140,000	Surplus fund	80,000
Building and fixtures	40,000	Deposits	800,000
Due from other banks	75,000	Due to other banks	55,000
Cash on hand	90,000	Undivided profits	25,000
	$1,060,000		$1,060,000

[1] *Bank Credit*, Chapter III.

The way in which this happens is as follows. Bank deposits are made in three different ways: (1) Cash is brought to the bank and deposited for safekeeping or so that checks can be drawn against it. (2) Checks on the same or other banks are brought to the bank and the amounts of them credited to the accounts of the depositors. (3) Loans are made and the money left on deposit in the bank so that the borrower can draw checks against it. Deposits made in the first way add equal amounts to the " Deposit " item and the " Cash on hand " item on the two opposite sides of the bank statement. Deposits made in the form of checks on the same bank cause no change in the bank statement—they simply shift deposit credit from one customer's account to another. If made in the form of checks on other banks, they add equal amounts to " Due from other banks " and to " Deposits " on the two opposite sides of the bank statement. If the checks against other banks are later collected in cash, the amount collected is shifted to "Cash on hand" on the same side of the statement. If deposits are made in the third way, the amount of the loan is added to " Loans and discounts " on the Resources side of the statement, and an equal amount, less the discount charge, is added to " Deposits " on the other side of the statement. Banks usually take interest on their loans in advance, that is, they *discount* their loans. Discount represents earnings of banks and is therefore added to " Undivided profits " on the Liabilities of the statement. Of these three ways of making deposits, the third is by far the most common. The business of merchants and manufacturers is the big business of the banks, and the deposits made by them along with their loans are the big deposits of a bank. A bank can keep on making loans on this basis and adding to its deposits until they reach the minimum ratio to cash reserves permitted by law. These minimums in practice run from 5 to 35 per cent of the deposits.

Now suppose any one of these depositors begins writing checks against his account. If the checks were all presented at the bank in person and cash taken away, then " Cash on hand " would be quickly reduced, and the bank would soon find its resources below the minimum. But this is not what usually happens. Instead, the checks are simply placed on deposit to the credit of the owner and no money is paid out. If the checks are presented to a different bank than the one against which they are drawn, a transfer

of cash to this bank may be required; but in most cases, the two banks will be holding checks against each other, and only the differences are settled in cash. In this way very little money is actually drawn from the bank. The amounts drawn from all banks in the aggregate is that which is carried around as pocket money, or is left in the tills and safes of merchants and other business agencies now and then needing a little ready money. More and more business in now being done with checks, and hence banks need to keep less and less cash on hand.

If for any reason a large number of depositors in a bank should suddenly withdraw their deposits, or those having checks on the bank should ask for their payment in cash, the cash reserves of the bank would quickly be depleted. Occasionally this sort of thing happens. It constitutes what is known as a " run on the bank." Most runs on banks occur in periods of money stringency or business depression when banks are in danger of failing and the public loses confidence in them. This is the reason that the national government and also most of the states require that banks receiving charters from them shall keep a certain reserve. National banks are required to keep all of their legal reserves in the Federal Reserve Banks. State banks in villages and smaller cities generally keep some of their reserves in banks in large cities. They are permitted under state laws to count deposits in other banks as part of their cash reserves.

The other safeguard of a bank is that a large part of its loans are for short periods, 30, 60 and 90 days being the most usual periods. This means that loans are constantly maturing, so that cash reserves can be built up rather quickly simply by refusing to grant more loans for a while. Banks usually prefer to make loans for as short a period as possible. At the end of this period, if cash reserves are still adequate, as is almost always the case, they are glad to renew the loan for a similar period.

Distinction must be made between two kinds of deposits, *demand* deposits and *time* deposits. The latter are in the form of *savings* deposits, or are represented by *certificates of deposit* running for a definite period. Time deposits draw interest at a low rate and need much smaller cash reserves. Loans are likewise classified as *demand* loans and *time* loans. Demand loans must be paid upon demand by the bank. The more usual type of demand loan is the so-called " call loan," which is terminable at any

moment by either the bank or the borrower. Such loans are used almost altogether in speculative markets and exchanges. Speculators need to be in a position to terminate loans and make new ones quickly as the volume of their transactions change. Banks also find such loans advantageous because they are always in a position to replenish their reserves. Interest rates on call loans are ordinarily lower than upon time loans. Some demand loans are made with the understanding that they will not be called by the bank except in case of great emergency. These are usually known simply as " demand " loans.

Short-time loans, if properly used, can also nearly always be rediscounted; that is, the bank can sell its notes covering these loans to another bank, ordinarily a correspondent bank in a larger city or a Federal Reserve Bank. This is a simple and easy way of building up cash reserves. Sometimes the notes are not sold, but are merely given as collateral for a loan from the correspondent bank.

Thus it is the primary function of commercial banks to make short-time or commercial loans. Their whole system of operation is worked out on the assumption of quick-maturing loans to provide working capital for business. In actual practice, however, commercial banks provide a great deal of investment credit. National banks were prohibited from making loans on real estate until the Federal Reserve Act of 1913 let down the bars a little. The state banks, with whom the national banks must compete, are permitted in most states to make loans on real estate up to 40 or 50 per cent of the capital or capital and surplus of the bank. In normal times, this is a safe practice, if the loans on real estate are carefully made. It represents a sort of supplementary enterprise which commercial banks are able to carry now that cash reserves actually needed have been reduced to such a low figure. In periods of extreme business depression, however, such as prevailed in 1921 and 1922, banks with a large volume of loans on real estate may be very greatly embarrassed. At such times, real estate mortgages are a drug on the market. It must be admitted, however, that most of the troubles of banks on this score in the recent depression were caused by bad loans rather than too many loans. Real estate loans against time deposits are much safer than against demand deposits; and banks in small cities and villages usually have relatively large time deposits.

All classes of banks, but especially national banks, make large investments in bonds, which is really a way of making an investment loan. Professor Harold G. Moulton found the national banks of the United States owning bonds and other investment securities in 1924 to the amount of $5,142,328,000 and the state banks to the amount of $2,718,155,000.[1] Bonds are in general much more readily marketable than real estate mortgages. This is practically true of the railroad, municipal and public utility bonds in which national banks mostly invest. Banks also invest to a limited extent in stocks.

The commercial loans of banks are commonly arranged by the use of either of two types of credit instruments, namely, promissory notes, and *drafts* or *bills of exchange*. These are commonly known in the money market as "commercial paper." *Single-name* promissory notes are signed only by the person or corporation giving the note. Very often this is all the security which they have. *Two-name* promissory notes are indorsed by a second party, who thereby makes himself liable for the note in case the borrower is unable to meet it at maturity. In practice, most two-name notes arise from sales on credit, in which the customer gives his note and the seller indorses it when he takes it to a bank to be discounted. This in effect amounts to the seller's guaranteeing that his customer will pay the note. Promissory notes are also frequently secured by stocks, bonds, other promissory notes, or "warehouse receipts," given as collateral. Warehouse receipts represent a given amount of wheat, cotton, corn or some other commodity being held in storage in a properly inspected warehouse.

A draft or bill of exchange is an order signed by the drawer instructing the drawee to pay a definite sum of money to a third party, the payee. The third party is usually the same person as the drawer. *Sight* or *demand* drafts call for payment immediately upon receipt of the draft. *Time* drafts call for payment on a certain date and must be presented to the drawee and "accepted" by him before they are good. The formal manner of accepting a draft is to write the word "accepted" across the face of it and sign one's name to this. When thus accepted, a time draft becomes an agreement by the drawee to pay the drawer, or whomever he may have designated as payee, a definite sum of money

[1] *Financial Organization* (1925), p. 383.

on a certain date—that is, to all intents and purposes a two-name promissory note. The only difference between the two is in the making. The buyer of merchandise writes the note and the seller indorses it. The seller of the merchandise draws the draft and the buyer accepts it Thereafter both buyer and seller are liable to the holder of the note or of the draft. The principal use of drafts is in connection with trading between different cities or regions or countries. The term "Trade Acceptance" is now commonly applied to time drafts used in ordinary commercial transactions in merchandise and raw materials. In such transactions the drafts are always made payable to the drawer. If drafts are drawn against the bank where the buyer does his business instead of the buyer himself, they are called "Bank Acceptances." The term bill of exchange is used sometimes interchangeably with the term draft, sometimes particularly for drafts used in foreign trade. Payments between buyers and sellers in different countries are largely arranged by means of bills of exchange. In the United States, a great deal of credit, even in transactions between manufacturers, jobbers and retailers in different sections of the country, is still carried in the form of book accounts. Since the passage of the Federal Reserve Act in 1913, the financial leaders of the country have been trying to induce business men to use trade acceptances and bank acceptances more freely, and their efforts have met with a little response.

Drafts sent to buyers of goods in other cities are always accompanied by a *bill of lading* which shows that the seller has delivered the goods to the railway company and that the railway has received them. If the buyer is well known to the seller, the draft and bill of lading may be sent directly to the buyer of the goods. The buyer accepts the draft by writing the word "accepted" across the face and signing his name below it. Such an instrument then becomes known as a trade acceptance. The more usual procedure, however, is for the seller to send the draft and bill of lading to a bank in the buyer's city. This is done to insure the seller against the possibility of the buyer's getting possession of the goods before he has made settlement for them. The bank receiving the draft and bill of lading notifies the purchaser that it holds the papers. The buyer goes to the bank and accepts the draft, whereupon the bank delivers the bill of lading to him. The accepted draft is then returned to the seller of the goods. If the draft is a

sight draft, the bank demands payment before delivering the bill of lading and remits the payment to the seller.

Sometimes the buyer finds he can secure more advantageous terms from the seller if he settles with a "banker's acceptance" instead of with a trade acceptance. Under such circumstances, he arranges to have his banker accept the draft, which is drawn upon the bank instead of upon the buyer. The bank becomes responsible for the payment of the draft when it matures. The buyer agrees in writing to become responsible for the payment of any drafts accepted by the bank for his account. The banker arranges for this by requiring the buyer to sign a trust receipt when the bill of lading is turned over to him. He thus acknowledges receipt of the goods and promises to sell them and turn the proceeds over to the bank before the date of maturity of the transaction. Its part in the transaction has been merely lending its name and credit standing to the buyer and assuming direct responsibility for payment of the draft in case the buyer failed to supply the necessary funds at the proper time. For this service the bank charges a small fee.

The seller of the goods need not wait for his money till the draft is paid. As soon as he gets his bill of lading, he attaches it to his draft and presents it at the bank to be discounted. If it is a sight draft, the bank's loan is only to the seller, and for the period during which the goods are in transit. If it is a time draft, there is the additional loan to the buyer for the period of the draft.

The foregoing makes it very evident that bank credit is quite different in its origin and method of handling from ordinary credit. In the first place, a given quantity of funds furnishes a basis for a much larger volume of credit if put to banking use or even deposited in a bank, than if privately loaned. In the second place, bank credit is much more commercial than most other credit. A clothing merchant in St. Paul could not possibly secure credit from an importer in New York City who had never had any dealings with him; but through the medium of a bank in New York City, a transaction is very easily arranged. The St. Paul banker knows the clothing merchant and is willing to make him a loan at any time. Having ascertained this, the New York bank will discount a draft drawn by the importer on the St. Paul merchant. Private individuals could and sometimes do function like banks in this latter respect; but ordinarily their scale of operation is too

limited to give them a recognized standing in the commercial world.

The other principal function of commercial banks is the issuing of paper currency. Until 1866, state banks as well as national banks were allowed to issue bank notes. If more cash was needed in order to meet the demand for loans, they simply issued more paper money. The more notes issued, the more the earnings from loans. These notes circulated as currency because the banks were pledged to redeem them in gold. During periods of business expansion when loans were in great demand, the banks rather generally issued too many notes. In the panics of 1814, 1837 and 1857 nearly all banks were obliged to suspend payments in specie (coin). The notes of many of the banks exchanged under their face value all of the time. Congress put an end to this impossible situation in 1866 by placing a tax of 10 per cent on all state bank notes. The present arrangements for issuing national bank notes were provided in the National Bank Act of 1863. The procedure for issuing them is as follows: The bank wishing to issue bank notes to the amount of $1,000 will buy government bonds whose par values total this amount and deposit them in the United States Treasury, together with the necessary 5 per cent gold (cash) reserve for redemption. The Treasury then sends the notes to the bank, where they are signed by its officers and paid out like any other currency. The volume of national bank notes in circulation is now decreasing slowly under a plan provided in the Federal Reserve Act for their gradual retirement. From 1913 to 1925, the decrease was from $756,900,000 to $696,600,000. In 1870 the circulation was only $291,800,000. Even when the circulation of bank notes was increasing, the ratio of note issues to deposits was rapidly declining. It was as 1 is to 1.7 in 1870, as 1 is to 6.5 in 1915, and as 1 is to 13.2 in 1924.[1] Thus banks are using bank notes less and less as a means of loaning money. One reason for this is that the Federal Reserve Notes are taking their place in the currency system.

Of the services which banks render incidental to the foregoing, the providing of a checking system is the most important. Checks are a very convenient and safe means of making payments. They save a tremendous burden and risk of carrying currency about, and a great deal of irksome counting of money. Hardly less useful

[1] H. G. Moulton, *Financial Organization* (1925), p. 354.

is the transmitting of money from one part of the country to the other and from country to country by means of bank drafts. Banks also serve as collection agents for their patrons, collecting not only trade drafts and promissory notes, but also bank drafts, checks on out-of-town banks, coupons, etc. Lastly, mention must be made of the services which banks render as money-changers and as safe-keepers of funds and valuables.

As part of this checking and collecting system, the banks in cities of any size have joined together and formed a central "clearing house" to which each day all the banks bring their checks drawn against each other. The checks upon Bank A in favor of Bank B, and upon Bank B in favor of Bank A, are balanced against each other and only the differences are settled, usually by means of simple acknowledgements of indebtedness called "clearing house certificates." Until the Federal Reserve Banks largely took over the function of intercity clearing, banks in the country sent their checks on banks in other cities to their correspondent banks in the larger cities, where they were put through the clearing houses along with the checks of city origin. The banks to whom checks on out-of-town banks were presented almost always took a small fee for this service. This practice is less general to-day.

The 1925 report of the Comptroller of the Currency showed 8070 national banks, 16,983 state banks, and 523 private banks in operation in the United States. These data give only the number of banks reporting and for that reason may not include a small number of banks, other than national, for which no report was made. There have been more state banks than national banks ever since 1896. After 1910, the number of national banks remained about constant at about 8000, while the number of state banks increased with startling rapidity until the business depression came in 1920. Since 1920, a total of 2535 banks have failed, only 343 of which were national banks. The least amount for which a national bank can be incorporated is $25,000. A very large proportion of the state banks started since 1910 have been incorporated at $10,000, $15,000, or $20,000. Of the 1,056 state banks operating in 1924 in Minnesota, 626 were incorporated for less than $25,000.

III. THE FEDERAL RESERVE SYSTEM

The Federal Reserve System created by Act of 1913 is an extension of the commercial banking system. It consists of twelve district banks located centrally in each of twelve Federal Reserve Districts,[1] a central governing Federal Reserve Board of eight members sitting in the Treasury Department, a Federal Advisory Board, consisting of one adviser from each Federal Reserve District, which meets quarterly and assists in the councils of the Federal Reserve Board, and the nearly ten thousand member banks. The system is semipublic in its organization and management. The capital stock of the twelve district banks was subscribed by the member banks in the districts, and the member banks appoint six out of the nine directors. The other three are appointed by the Federal Reserve Board, the members of which are appointed by the President, and two of whom are the Secretary of the Treasury and the Comptroller of the Currency. The Federal Reserve Board, moreover, has power to remove any officer or director of a Federal bank, and to suspend the operations of any such bank, also to require the several banks to make loans to each other when needful in order to keep the business at a proper level. One of the three Federal Board appointees to the boards of directors of the Federal Reserve Banks is known as the Federal Reserve Agent. Aside from his special duty of acting for the Federal Board in the issuing of Federal Reserve Notes, he also represents its interests and points of view in other matters.

The real power of the Federal Reserve Board over the district banks, however, is in its possibilities of strong leadership. The twelve district banks are in a position to exert a strong influence upon business and financial conditions. First is their power to rediscount the notes, drafts and other commercial paper of the member banks. A very free exercise of this power may expand business unduly or be just what is needed to lift it out of depression. A cautious use of this power will have the opposite effect. Along with the foregoing, these banks, subject to approval by the Federal Reserve Board, have authority to fix their own rediscount rates, and thus expand and contract the demand for rediscounting service. It is expected that in normal times the rates

[1] Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco.

so fixed by the district banks will influence the prevailing rates and that thus the volume of all borrowing will be somewhat regulated. These banks are further authorized to buy and sell foreign and domestic bills of exchange and other forms of commercial paper in the open market. It is to be expected that if a Federal Reserve Bank offers to sell commercial paper in considerable quantities, the market will absorb these increased offerings only at a lower price, which means that the credit instruments will yield a higher rate of interest to the purchaser. Thus the market rate is raised by means of Federal Reserve selling. In practice, the banks combine these two methods of influencing the discount rates, usually doing the selling first. They are then able to say that in raising their rates they are merely following the market. There is much difference of opinion among bankers and students of the question as to how much control the fixing of discount rates and the open-market transactions really give the Federal Reserve System. The majority opinion probably assigns only a very moderate importance to those two controls, especially to the open-market transactions.

Of similar significance is the power of the district banks to issue Federal Reserve Notes. This represents a new type of currency in the United States. Fundamentally, as already explained, they are secured by rediscounted commercial paper deposited with the Federal Reserve Agent of the bank, and after the commercial paper has been retired at the expiration of the loans, by a 100-per cent reserve of gold or gold certificates or by a substitution of additional paper. Although the Federal Reserve Banks are required, under a 10-per cent penalty, to return all Federal Reserve Notes to the bank of issue immediately upon receipt of them, it may be a long while before they get to a Federal Reserve Bank, and hence some means must be provided for securing them after the commercial paper is retired. Furthermore, a Federal Reserve Bank is not required to retire its own notes when it receives them, but may return them to circulation and keep the gold and gold certificates in its vaults. During the War, the banks purposely followed this policy with the result that most of the gold and gold certificates in the country collected in the Federal Reserve Banks. The present policy is to put more gold certificates into circulation and retire more of the Federal Reserve Notes. The purpose of the provision for issuing Federal Reserve Notes was to make our

money more elastic. The old national bank note circulation was not in the least elastic. It takes more dollars' worth of bonds and redemption fund to produce a new national bank note than the bank note represents. To expand the Federal Reserve Note circulation, all that is needed is good assets and a 40-per cent gold reserve. As business grows, assets expand; and hence currency can expand with business. There is doubt in the minds of many as to whether our present system does not permit too rapid expansion of currency, and contracts it quickly enough afterwards. It is very certain that the Federal Reserve Banks by their command of this function can strongly influence the trend of business.

The Federal Reserve Banks are also given power to buy bullion in any market, domestic or foreign. This with the power to buy foreign bills of exchange puts them in a position to take whatever actions are necessary to protect the gold reserves of the nation.

If each of the various district banks insisted upon going its own way, and its policies were ill-informed, obviously such a system as the foregoing would break down. Accordingly the leading bankers of the country opposed it when it was being considered in Congress. They wanted one central bank and more control. In practice, however, the Federal Reserve Board has been able to harmonize the interests and points of view of the different banks and establish a unified national policy.

Two other important services are rendered by the Federal Reserve Banks, namely, acting as Central Reserve Banks for the cash reserves of the member banks, and acting as clearing and collecting agencies for banks in their districts. All member banks are required in the Federal Reserve Act to keep all of their legal reserve in the Federal Reserve bank of their district. In compensation for this, the reserve requirements were reduced somewhat. The framers of the system believed that less reserves would suffice if they were all mobilized in one bank. The Federal Reserve Act as passed in 1913 authorized the district banks to establish a clearing and collecting system for all the banks of the country. Since this meant disturbing the existing relations between correspondent banks in city and country, the Board took its time about working out a system, and only in 1916 made its system compulsory on all member banks. All checks cleared through the Federal Reserve Banks are collected at "par," that is, without charge for the services. The member banks thus lost a minor source of

income; but in exchange obtained a better organized and more complete service. The efforts made to include non-member banks in the system in 1919 met with considerable resistance. The non-member banks objected to the loss of their fees. In spite of the opposition, however, over 25,000 banks have entered the clearing system and are now collecting at par. Clearings within any Federal Reserve district are handled simply by debiting and crediting the accounts of the clearing member banks; and clearings between the twelve districts are handled by debiting and crediting their accounts with the Federal Reserve Board in Washington. Each of the twelve banks is required to maintain a clearance fund of $1,000,000, in excess of a sum of gold or gold certificates equal to its indebtedness to the other banks of the System, in the Treasury under the administration of the Federal Reserve Board.

The Federal Reserve System on December 31, 1924, had for its membership the 8043 national banks and 1544 state and other banks. The number of state banks in the system increased from 37 to 1544 between 1916 and 1924. During the same period there was a net increase of 1533 state banks in the United States. In order to attain this increase, more than 3100 new banks were organized, since during this period 1587 state banks failed or went into voluntary liquidation or were consolidated, or were converted into national banks. It is apparent, therefore, that the membership of state banks in the Federal Reserve System is not increasing at the same rate as their growth in numbers. It is commonly believed that banks can make larger profits outside of the System than within it. State banking laws are in general more liberal than the national banking laws in the matter of capitalization, loans and reserves. State banks have to submit to fewer examinations and make fewer reports. Many believe that all the state banks should be brought into the System as quickly as possible. Others believe that the Federal Reserve System should include only banks of the commercial type with highly liquid assets, and that there should be a place outside the Federal Reserve System for banks which make loans on real estate a considerable part of their business.

The Federal Reserve System is still on trial. It has enemies who are seeking all the time in Congress and out to abolish it. Nevertheless, it seems reasonable to expect that it will be con-

tinued. Most students of banking look upon it as a remarkable achievement, a credit to the Wilson administration which worked out its final form, and on the whole a most important contribution to financial progress. The System was of tremendous service in financing the War. Following the War, it probably made the serious mistake of raising its discount rates nearly a year too late. For this mistake, its connection with the Treasury Department is usually blamed. Secretary McAdoo wished to keep the discount rates down while he was floating the Victory Loan of 1919. This was undoubtedly a mistaken policy. There are many who favor divorcing the Federal Reserve Board from the Treasury Department.

IV. INTERNATIONAL EXCHANGE

We have now reached the point where we can discuss the financial part of the mechanism of international exchange. Table XXXV shows that the bulk of international payments arise as a result of exchanges of goods. The other important payments arise from investments and sale of property in foreign countries, purchase and sale of foreign securities, payments of interest on foreign investments, loans to foreign governments, banks and industries, ocean freight and insurance charges, foreign commissions and brokerage fees, tourists' expenses, immigrants' remittances and government expenses abroad.

Most payments between countries are effected without any exchange of gold by the use of bills of exchange drawn by the sellers in the exporting countries upon the buyers in the importing countries. As in the case of domestic trade, the bills of exchange are transmitted through banks; in this case, banks in import and export markets which handle foreign exchange as one of their major functions. If the trade between countries balances, so that the drafts exactly offset each other, then no gold need be shipped. In this balancing, the exchanges arranging payments of interest, freight, tourists' expenses and the like count on exactly the same basis as exchanges to pay for goods. The actual manner in which the canceling of obligations between countries is arranged can be illustrated by the case of the United States and Great Britain. The British exporters draw bills of exchange upon the American customers and present them to banks in Great Britain. If they are sight drafts, the British banks deduct their fee and remit the

balance to the exporters. They are now holding bills of exchange against American importers, upon which they could secure payment merely by forwarding them to the proper American banks. But they do not need to do this, for Americans are constantly exporting to Great Britain, and are drawing bills against British importers, which they sell to American banks just as the British exporters do their bills to the British banks. To complete the process the American banks sell their bills to the British banks, receiving credit on the books of the British banks, which is ap-

TABLE XXXV. ESTIMATED BALANCE OF INTERNATIONAL PAYMENTS OF UNITED STATES, 1924. (VALUES IN MILLIONS OF DOLLARS.)[1]

Items	*Credit*	*Debit*	*Balance*
CURRENT ITEMS			
Visible Current Items: Merchandise......	$4,621[2]	$3,651[3]	$+970
Invisible Current Items:			
Interest and dividends...............	614	150	+464
Ocean freight.......................	76	68	+8
Government payments...............		5	—5
Services to tourists..................	100	600	—500
Charitable and missionary expenditures.		55	—55
Immigrants' remittances.............		300	—300
Total, invisible current items	790	1,178	—388
Total, current items except gold and silver	5,411	4,829	+582
MOVEMENT OF CAPITAL			
New foreign loans, exclusive of refunding..		795	—795
Sale and purchase of outstanding securities	319	114	+205
Foreign bonds paid off.................	45		+45
Principal of interallied debt.............	23		+23
United States paper currency...........		50	—50
Total, capital items....................	387	959	—572
GOLD AND SILVER			
Gold..................................	62	320	—258
Silver................................	110	74	+36
Total, gold and silver..................	172	394	—222
Total, all items........................	5,970	6,182	—212
Add increase in foreigners' bank deposits, as revealed by questionnaire........			+216
Balance (representing errors and omissions)			+4

[1] *Commerce Yearbook*, 1924, p. 465.
[2] Includes $30,000,000 for unrecorded parcel post packages.
[3] Includes $40,000,000 for smuggled liquor.

plied to the bills upon them held by the British banks. If the volumes of exchange of goods and other payments between the two countries is equal, no gold need be transferred.

In actual operation, any country with an appreciable volume of foreign trade has a regular market for foreign bills of exchange. Those with goods to export to a foreign country have bills of exchange to sell; those with payments to make are looking for bills of exchange to buy which they can use in making payments. What happens in the United States usually is that the foreign exchange bankers buy all available bills of exchange on foreign countries, then sell these bills to their correspondent banks in Great Britain, receiving credit on the books of these banks for the proceeds, and then sell drafts against their accounts with these foreign bankers. What the American banks really buy, therefore, is bills on Great Britain, and what they sell is also bills on Great Britain. The market for foreign bills of exchange in the United States is therefore really a market for bills on Great Britain. The prices of such bills are therefore quoted in British money, that is, in pounds sterling, equal to $4.866 of our money. In periods when many payments are being made to Great Britain, there is a strong demand for bills on London, and those who have bills on London to sell can dispose of them at a premium. In other periods, there may be more people with bills to sell than buyers, and bills on London may sell at a discount. Thus the actual price paid for a pound sterling's worth of sterling exchange may be something more or something less than $4.866. If it gets too far above the point $4.866, called par of exchange, because of a large volume of payments due Great Britain, then it will actually pay to ship gold to Great Britain. And if the price of sterling exchange falls too far below par, it may pay to ship gold to the United States. The points above and below par at which it pays to ship gold are called the upper and lower gold points.

These gold points are seldom reached in actual practice because a rise in the rate of sterling exchange makes exporting to Great Britain and borrowing from Great Britain especially profitable, which quickly increases the supply of available bills on London and reduces the price of exchange. Conversely, a low rate of sterling exchange encourages importing from and loaning to Great Britain.

Prices and interest rates in the two countries also have an important relationship to the rate of exchange. If prices are rela-

tively high in the United States, importing will be increased and exporting decreased, which will raise the rate of exchange, possibly even above the gold points. In that event, gold will be shipped to Great Britain, which will lower prices in the United States and raise them in Great Britain. Relatively high interest rates in the United States increase borrowing abroad and lower the rates of exchange, possibly even below the gold points, causing gold to be shipped to the United States.

The foregoing description is in terms of exchange between the United States and Great Britain. It might have been given in terms of the United States and France, of the United States and Japan. As a matter of fact, a large part of the exchange of the world, especially the exchange of Europe, is arranged in terms of sterling exchange. An importer of linen from Belgium and a Danish importer of oilcake from the United States may both satisfy their obligations with drafts on London purchased in their home markets.

Furthermore, it is not necessary that the payments between any two countries shall balance in order to keep the rates of exchange in line without shipping gold. Our payments to Europe are generally less than the return payments. Our payments to Brazil are more than the return payments. Brazil's payments to Europe are more than the return payments. Under these circumstances, the United States importers of Brazilian coffee pay for it with bills on London, which are available in large quantities in our markets, and the Brazilian importers use the bills obtained from the United States to meet their obligations in Europe. Triangular arrangements of this kind commonly prevail in international trade.

It should be obvious that no compulsion of any kind forces the United States to arrange its payments with Great Britain and Europe in terms of sterling exchange. The British importers and exporters could buy and sell bills on New York, the debits and credits being canceled on this side of the Atlantic. During the War, a great many payments were arranged in this way. Great Britain's wider and better developed trade connections, and her central location in the world's commerce, give her an advantage in this particular, and it now looks as if the United States would continue for a long time to make most of its international settlements in sterling exchange.

The foregoing is far from a complete account of the mechanism

of international payments. Mention might be made of the special dealers who do nothing but buy and sell foreign exchange. The banks handle by no means all of this business. Especially is this true in New York City. One might also explain in detail the use of *commercial letters of credit* in arranging transactions between parties unknown to each other in different countries. To illustrate, a Russian importer of farm machinery might obtain a letter of credit from a bank in London authorizing a New York bank to accept a draft drawn upon it by an American manufacturer. Enough has been said, however, to give the general outlines of the picture. The bold relief of this picture is a world-embracing monetary and price system. No country expecting to carry on trade with the rest of the world can set up a monetary system patterned solely according to its own fancies. No country carrying on international trade can maintain a price level of its own. All prices in all countries are part of one great system.

V. OTHER FINANCIAL INSTITUTIONS

In this section will be briefly described a number of special types of financial institutions, all of these closely allied to those already described.

The Federal Farm Loan System.—The Federal Farm Loan System is a semipublic institution like the Federal Reserve System for the purpose of making real estate loans to farmers. It was established in 1916 after much discussion of the problem and study of European land credit institutions. The system really has two parts, one the twelve Federal Land Banks and supporting National Farm Loan Associations, and the other the Joint Stock Land Banks. The first part of the system follows the Federal Reserve System closely with its appointed Federal Farm Loan Board and the directorship of the district banks divided between local directors and those appointed by the Federal Farm Loan Board. There being no local institutions comparable to the member banks of the Federal Reserve System, the Act had to provide for their creation. It was thought best, following European experience, to make these local institutions coöperative so far as possible. Hence they are called "associations." The membership in these associations consists solely of borrowers. Any ten borrowers may form an association. The capital stock of the Federal Land Banks, except for the $9,000,000 furnished at the start out of the

United States Treasury, is contributed by the borrowers at the rate of $5 for every $100 borrowed. The stock of the bank is issued to the National Farm Loan Association which in turn issues stock of an equal amount in the local association to the individual borrower. This $5 serves as additional security for the loan, and the district bank is required to keep one-fourth of it in the form of quick assets.

The loans are arranged in the following manner: The prospective borrower makes application for a loan from his nearest National Farm Loan Association. An appraisal committee of three examines the farm and farmer and recommends the loan. An appraiser of the Federal Land Bank also makes an examination and report. The Federal Land Bank approves the loan. The borrower then makes out a first mortgage against his farm, has it indorsed by the local Farm Loan Association, which then forwards it to the Federal Land Bank, which thereupon deducts the 5 per cent capital stock contribution and advances the balance of the funds to the local association. The mortgage can be written for no more than 50 per cent of the value of the land plus 20 per cent of the value of the buildings upon it. It must be paid off upon the "amortization plan," that is, a certain percentage of the principal along with the interest each year, except that after five years, additional payments can be made upon the principal. The interest rate is now 5 per cent to the borrower. The Federal Land Bank receives ½ of 1 per cent for its margin. The Act limits its maximum margin to 1 per cent. The profits of the bank are paid to the local association as dividends on the 5 per cent capital stock contribution. The local associations in turn pass on the earnings to the individual borrower in the form of dividends on their own stock.

The Federal Land Bank at once converts its mortgages into 5 per cent bonds, which are offered for sale on the investment market. The bonds are issued in the name of the individual bank, but are jointly guaranteed by all of the banks in the system. They not only have the security offered by the individual farmer, but also that of the indorsing association to an amount equal to the stock held by the local association in the Federal Land Banks, and also that of the whole Federal Land Bank System. Lastly, they are tax exempt. It is small wonder, therefore, that they find a ready market.

The Joint-Stock Land Banks are much more nearly private institutions. They must obtain their charters from the Federal Farm Loan Board, must organize according to specifications laid down in the Act, must make loans on approximately the same terms as the Federal Land Banks, and must deposit their mortgages in trust with the Registrars of a Federal Land Bank. Their bonds, however, are obligations of the individual banks issuing them. The Joint-Stock Land Banks were incorporated in the system on the expectation that they would largely take the place of the private farm mortgage companies. The agitation for the farm loan legislation centered around the farm mortgage companies very largely. It was commonly believed that they kept mortgage rates altogether too high and charged exorbitant commissions for making loans.

On December 31, 1925, the Federal Land Banks had made 379,875 loans for a total amount of $1,169,356,599, and they had $1,005,684,616 of loans outstanding. There were 4657 Farm Loan Associations in operation on the same date. The twelve banks now have a capital stock of $53,769,567, have earned $34,964,937, and have paid $14,590,535 in dividends. The 53 Joint-Stock Land Banks in operation on December 31, 1925, had loans in force to the amount of $545,559,200.

In the nine years of operation, up to December 31, 1925, the Federal Land Banks and the Joint-Stock Land Banks had foreclosed on 10,803 farms. But their total losses on these farms were only $412,230. This was because of the wide margin of security taken on the loans. The achievements of the Federal Farm Loan System have thus amply justified it. It has undoubtedly lowered mortgage interest rates on good risks in many sections of the United States, and yet has conducted its business upon a thoroughly safe basis. It has introduced a good deal more order into the farm loan business. It is to be hoped that it will be able to expand the scope of its operations sufficiently in the near future so that there will be no further excuse for creating state farm loan agencies, as South Dakota, Minnesota, and other states have recently done. Local bankers and private individuals will always carry a considerable proportion of the loans on farm land. Insurance companies also loan a great deal on farm mortgages. There is no reason why the rest should not in due time be carried by the Farm Loan System. There will always be the problem of the very

doubtful risk, and of the farmer who wants an 80-per cent loan; but these will no doubt have to be carried outside of the System.

The Federal Intermediate Credit System.—After the creation of the Federal Reserve System and the Federal Farm Loan System, there still remained one important field of credit not well provided for, namely, the field of intermediate credit for agriculture, to which reference has already been made. Local banks have handled loans of this kind by making them for six months and then renewing them. In the business depression of 1921–2, however, many banks were unable to renew such loans when they came due, and the farmers were in dire need of credit because of the very low level of agricultural prices prevailing. The agitation resulting led to the passage of the Agricultural Credits Act of 1923.

This Act sets up a Federal Intermediate Bank in each of the Federal Land Bank cities. The Land Bank officers and directors are ex-officio officers and directors of the Intermediate Credit Banks, and the System is administered by the Federal Farm Loan Board. In putting the Act into operation, the Federal Farm Loan Board decided that the Credit Banks should have entirely separate management, and hence have appointed special officers for each bank. The capital stock for the System was contributed out of the Federal Treasury, a maximum of $5,000,000 for each bank, of which only $2,000,000 has thus far been called for. The Credit Banks raise their funds by issuing trust debentures secured by the notes covering the loans, and by the joint assets of the whole Intermediate Credit System. This system, it is apparent, is much more nearly a public enterprise than either the Federal Reserve or the Farm Loan System.

The Credit Banks make no loans direct to farmers. The nearest they come to this is their loans to coöperative marketing associations which are associations of farmers. The rest of their loans are made by rediscounting the notes of banks, agricultural credit corporations, and incorporated live stock loan associations. The Credit Banks were making direct loans to corporations at 5 per cent interest at the end of 1925, and were also rediscounting agricultural paper at 5 per cent. The Act permits banks, credit corporations and the like a margin of 1½ per cent. This means that the farmers pay 6½ per cent. On live stock loans, the Federal Farm Loan Board has raised the margin to 2 per cent.

These margins are less than banks usually take, and for this

and other reasons the banks have made very little use of the rediscount facilities of the system. Of the $177,632,940 of loans made in 1925, $124,174,009 were to coöperative marketing associations, and $53,458,931 to agricultural credit corporations, live stock loan companies, and banks. Live stock loans discounted during 1925 totaled $28,435,993. The agricultural credit corporations have been formed especially to take advantage of the Act. There were 302 of them operating on August 1, 1925, and their number is increasing. A number of live stock loan companies are included in this group. There is no real distinction between the two types of companies except in the type of security accepted. The Intermediate Credit Banks treat both types of credit corporations exactly the same.

How large a place the Federal Intermediate Credit System will find for itself remains to be seen. It would appear that the cooperatives will make the largest use of it. Eventually the cotton marketing associations of the South may be able to procure production credit for their members at rates much lower than the exorbitant rates paid at present. The next severe business depression that hits the country may cause the banks to make great use of the System.

Savings Institutions.—The principal type of savings institution is the savings bank. Of the 1583 savings banks reporting to the Comptroller of the Currency in 1925, 972 were of the stock type, and 611 were of the mutual type. A savings bank differs from an ordinary commercial bank in that its deposits are all time deposits drawing interest, and its loans are nearly all of the investment type. Deposits made in a savings bank can be withdrawn only by the depositors themselves. No deposits arise as a result of loans as in the case of commercial banks. Since, however, depositors may wish to withdraw their savings at any time, some cash must always be kept in reserve. In periods of financial stress, savings banks have frequently had difficulty in getting together enough cash to cover all withdrawals. Accordingly it is desirable to have a part of the investments in bonds and other readily marketable securities. Also for the same reason, savings banks are now making many short-time loans. Hence it can no longer be said that savings banks raise funds only for fixed capital purposes.

The essential features of good management of a savings bank revolve around maintaining adequate cash reserves, keeping some

of the investments liquid, and making good investments and keeping them well distributed. The profits of a savings bank are made out of the margin between the low rates of interest paid on savings, usually around 3 per cent, and the high rates obtained from the investments. Out of this margin must be paid the operating expenses of the bank. If the bank is of the stock type, the profits are distributed as dividends upon the capital stock of the bank. A mutual savings bank has no capital stock. The only funds it has to do business with are the deposits of its members. Every depositor is a member. The profits of such a bank, except such as are set aside as surplus or undivided profits, are distributed as dividends on the deposits. In 1924, the average for all mutual savings banks was 4.16 per cent.[1] Stock savings banks are decreasing in numbers very rapidly. The mutual savings banks are located mostly in the industrial districts of the East.

Commercial banks now generally have savings departments. The Federal Reserve Act of 1913 provided for savings departments in national banks, and designated a reserve of 3 per cent against time deposits.

The postal savings bank system of the United States was established by act of Congress in 1910, after forty years of agitation for it. As passed, the act amply protects the interests of the commercial and savings banks. Only 2 per cent interest is paid on deposits, and no person is allowed to have a deposit of more than $2500 except by special authorization. The postmasters are required to re-deposit the postal savings funds in commercial or savings banks in the same locality, where they draw 2½ per cent interest. About four hundred thousand people in the United States have postal savings deposits averaging around $320 each. The depositors are largely people who are timorous about depositing their money in banks. A majority of them are of the immigrant class.

The total deposits and other related liabilities of all the foregoing types of savings institutions were probably about $16,500,000,000 in 1925. The savings accumulated in this way therefore contribute no inconsiderable part to the financing of enterprise in the United States. Most of these funds would be saved anyway, it is true, but they would be far from advantageously used. The savings bank can handle sums too small to be invested in stocks

[1] H. G. Moulton, *Financial Organization*, 1925, p. 324.

and bonds and mortgages, can receive savings in such a way that they can be recalled again if necessary, and can make much safer investment of them than the rank and file of small investors. Furthermore, it is a much simpler matter to make a deposit in a savings bank than to buy stocks and bonds.

Building and Loan Associations.—In their original form, building and loan associations were simple coöperative organizations of prospective home builders. The members each put a certain amount of money into a common fund each month, and houses were built as fast as the funds accumulated. Those who built first gave a mortgage for their remaining payments. When all the houses were built and the payments collected, the association was dissolved.

In the modern form, the associations are continuous, the members receive shares of stock when they make their contributions, they may make payments and receive shares of stock in any amount they desire and at any time, they may also turn in their shares of stock and withdraw from the association at any time, and a large proportion of the shareholders are not prospective home builders at all, but mere investors. The loans to members for building purposes are secured by their holdings of stock as well as by the houses they erect. This plan of operation has secured a great deal of help from outsiders. A majority of the associations, however, are organized on a plan intermediate between the old and the new, which permits taking in a new group of members once a year usually. There are about twelve thousand such loan associations in the United States with assets totaling around five billion dollars. They have rendered a great service to people in humble circumstances in the United States by encouraging thrift, by providing a simple and easy plan by which an individual can accumulate money in preparation for building, or by which he can finance his building in case he does not want to wait till he accumulates the money, and by doing all this at a low cost of administration. Recent experience, however, has shown that many building loan associations are not being managed along safe lines, so that government supervision has become highly necessary.

Coöperative Credit Institutions.—Aside from the building and loan associations, the United States has relatively few coöperative credit institutions. A number of states now have laws permitting the establishment of coöperative " credit unions " patterned after

the European credit unions. A few have been established, North Carolina having about thirty. The European credit unions are small affairs. They provide credit in small amounts at a low rate of interest to farmers living in the immediate community. Their costs of operation are very low and their losses negligible. They generally need more money than is available in the community, and receive this from the outside generally on the mutual liability of all members of the union. Mutual liability is feasible because the members live in the same community, and are well known to each other. Unions of this type are found nearly all over Europe. There are also large numbers of them in Japan, India and the Philippines. Obviously they are not suited to conditions in most of the United States, certainly not to conditions in the corn belt and western states. The country bank is the American institution which takes its place. If agricultural credit ever becomes coöperative on a large scale in the United States, it will come by converting country banks to a coöperative basis. There are only a few such banks now. For the present, coöperative credit will be obtained mostly through coöperative marketing associations. Thus far the credit secured in this way has been used for financing the movement of the crop to market and making advances to growers while the crop is held awaiting a favorable time to sell. It will be used increasingly in the future for the financing of the growing of the crop as well. The cotton coöperatives have already demonstrated that this can be done successfully.

Trust Companies.—The report of the Comptroller of the Currency for 1925 reports 1680 trust companies in operation in the United States. A few may not have reported. In their present form, trust companies are relatively new institutions. Their number did not get above a thousand until 1909. Many trust companies carry on commercial and investment banking as side lines. Their primary functions are to act as *agents*, *trustees*, or *custodians*, *for individuals*, *estates*, *and corporations*. Following is a sample list of the services that may be rendered by a trust company:

1. Act as the administrator, executor or guardian of an estate.
2. Act as trustee for an estate under a will, with instructions as to carrying out its provisions.
3. Serve as custodian of the money or property of an estate while it is going through probate court.

4. Receive insurance funds after the death of the insured and distribute them according to instructions in trust agreements.
5. Act as attorney or agent for any person or corporation in a transaction.
6. Act as fiscal agent for corporations, perhaps serve in the rôle of treasurer for them.
7. Act as depository for the stocks, bonds and other claims to property of a corporation while it is being reorganized.
8. Serve as transfer agent in the absorbing of one corporation by another by means of new issues of stocks and bonds.
9. Arrange for the execution and registration of mortgages and bonds of corporations.
10. Receive upon deposit for safe-keeping all forms of securities or other valuables.

The mere recital of this list makes clear the need for institutions of this kind. The increase in the complexity of modern business and in the number of small fortunes in the last fifty years has made trusteeship a much demanded type of specialized service.

Insurance Companies.—Chapter XXIII showed that taking care of risk is one of the important parts of the production process, and that some risks are insurable and others not. Highly specialized agencies have been established for financing those risks which are properly insurable. Some aspects of the organization of these agencies will be discussed in this section.

There are two methods of collecting payments in cover insurance losses, one to wait until the loss occurs, and then assess the amount of it to the policyholders, and the other to estimate the losses in advance and the amounts required to cover them and collect this when the policy is written or at stated intervals during the life of the policy. The assessment method was once used by many fraternal life insurance companies. To-day many local farmers' mutual fire insurance companies operate on this basis; also occasional associations of workingmen for carrying life insurance. But in general the assessment method has been abandoned. In the field of fraternal life insurance, it broke down because the younger men were disposed to drop out and the older men to stay in. This made the assessments very high on those who remained.

The second method of collecting payments accumulates large reserves, especially if the insurance company is growing rapidly,

which the company must invest. Insurance companies are therefore significant in the financial world also as accumulators of funds for investment. The life insurance companies of the United States invest mostly in real estate mortgages and in bonds; and the fire and accident insurance companies mostly in bonds, so as to be able to meet unexpected large losses.

Life insurance companies must also be considered as savings institutions. The annual payments on policies must be looked upon as savings as surely as if they were put in a savings bank. This is especially true now that all insurance companies make loans to their policyholders. The volume of such loans is rapidly increasing.

Insurance companies may be classified as of two types on the basis of control and methods of distributing earnings. *Stock* companies are managed like any other corporation and distribute their earnings as dividends on the shares of stock. The *mutual* companies have no stock and accumulate their earnings as surplus belonging to the policyholders, to be distributed at the termination of the policy, or used as a deduction against annual premiums. Both types of companies must maintain intact the legal reserves of the individual policyholders. Most insurance rates are higher than really need be. The mortality rates used in calculating life insurance payments are too high for the selected risks which most companies write. The death losses of a number of large insurance companies represent around half of the payments collected. The result is that large surpluses normally accumulate which are returned to policyholders as earnings or dividends. A large mutual accident insurance company distributed a 20 per cent cash refund to its policyholders in 1925.

This book is not the proper place to discuss the details of the different types of life insurance policies, but it will be well to distinguish a few of them. A whole life policy calls for payments throughout the life of the insured. Such a policy is purely protective in its effect. It may be a hardship upon some people to keep up their insurance payments after they are no longer able to work. Accordingly many 10-, 20-, and 30-payment life policies, calling for completion of all payments at the end of the specified period, are now being written. Endowment policies call for payment to the insured of the amount of the policy at the end of a specified period, usually twenty years. Such a policy pro-

vides protection for the term of the policy, but is really more of an investment policy than an insurance policy. The annual payments are very high. Term policies provide protection only, and for a specified period. Like fire insurance policies, their benefits expire at the end of the term. Disability policies provide that the insurance is due as a lump sum, or in the form of annuities, in the event of the disability of the insured. Disability clauses are frequently written into other types of policies.

Accidental death or injury while at work is now generally covered by "liability" insurance or "compensation" insurance. Under the common law, the employer is not responsible for injury to workmen if he provides a reasonably safe working place, or if fellow workers have contributed to the accident by negligence. Statutes were passed in many countries endeavoring to increase the responsibility of the employers. The losses and legal expenses incurred as a result forced many employers to take out liability insurance as protection. Beginning in 1910, the various states, following European precedents, took a further step and practically abrogated the common-law defense of employers, and either required the employers to compensate workmen and their families for all accidents regardless of cause, or else gave them the option between this and fighting their battles without the common-law defenses. The compensation acts provide a scale of compensations for different kinds of injuries, and distribute the payments over a period. The scale is usually based on wages, and the payments run from half to two-thirds of the weekly earnings. Death benefits range from $3000 to $6000. To make certain that the compensation is paid, the acts require the employers to carry compensation insurance, which passes over to an insurance company the obligation to make the payments specified in the acts. In most states, large employers are allowed to carry their own compensation risks under appropriate regulations. Very small employers are frequently excluded from the operation of the act. Compensation insurance laws are usually administered by special commissions.

Sickness, old age, and unemployment are closely related forms of insurance which are provided in many countries of Europe. These and accident insurance are generally put in one class called *social* insurance.

Fire insurance is the most completely accepted of all forms of

insurance, and at the same time one of the most difficult types of insurance to administer. The fire hazard, and hence the insurance rate, varies with the type of construction, the use and occupancy of the building, the fire protection, the external exposure, and the moral hazard, this latter including not so much danger from incendiarism as from carelessness. Over a fourth of all fires are contracted from neighboring buildings, passing trains, and the like. One of the serious problems of fire insurance is providing properly for fires which sweep over whole city blocks and whole cities. Such catastrophes may force insurance companies into bankruptcy and leave the insured with only partial indemnity.

Urban property is generally insured for its full value, and rural property at three-fourths its full value. Most fire insurance policies, unless state laws interfere, limit the indemnities to the actual loss incurred regardless of the amount of the policy. Buildings depreciate or become obsolescent after policies are written, so that they may easily be insured for more than they are worth.

The Lloyd's Associations, the original of which is the London Lloyd's, represent the most interesting type of insurance available. These associations not only carry marine and fire insurance, but almost any conceivable sort of risk. They particularly favor risks of the unusual sort, such as bad weather on a single day or week, outcomes of elections, etc.

Financial Institutions of the Marketing Type.—The list of financial institutions is not complete without including another whole group, namely, the group concerned with the marketing of various kinds of securities and instruments of credit. This group includes the investment banks, the stockbrokers, the stock exchanges, mortgage companies, the cattle loan companies, the notebrokers, and the commercial paper and discount houses. These agencies ordinarily bring no commercial paper or securities into existence; they merely deal in them, or find buyers for them after they come into existence. They are the middlemen of finance comparable to the commission merchants, brokers and jobbers in commodity marketing. Discussion of their functions is reserved to the chapter on Marketing Organizations.

VI. THE PROBLEMS OF FINANCIAL ORGANIZATION

The fundamental issue in financial organization is between the advantages of specialization, of combination of enterprises and

services, and of large volume of business. Each of the institutions above described renders certain financial services. The insurance companies and Farm Loan Banks each confine themselves to a single service; the trust companies perform a group of closely related services; and the ordinary commercial banks a still larger group of them, some of them not so closely related. There is great advantage in specialization if there is enough volume of business to warrant it. There is great advantage in combination of services if the volume of business is small.

The small country village needs the convenience of a local checking and safe-deposit service. But a bank cannot subsist upon these alone. The loan business, which is the principal support of a bank, is not large enough in such a village to maintain a bank upon a reasonable basis. There are local loans which a bank this small is unable to handle. The local grain elevator needs more money to move its crop than such a bank can possibly provide. There are, no doubt, real estate loans enough, but a bank cannot safely tie up a very large part of its assets in loans of this type. If a bank is to subsist in such a place, it must therefore bring together all the services that it can. Loans that it cannot make itself, such as real estate loans, large loans to live stock feeders, loans to local industries, it must act as broker or commission merchant for if possible. It must also act as agent for investors in the community. It must combine the functions of a commercial bank, a savings bank, a trust company and an investment bank. Country banks also commonly take agencies for nearly all kinds of insurance, and they often carry on an extensive real estate business as a side line. But in spite of all this combination of services, the loan rates are high. A more serious difficulty is that the man who is satisfied to be a banker on an income such as is likely to be available under such circumstances is not likely to render a high grade of banking service. The result is that many such banks are poorly managed. The defect in management which is most serious is their willingness to make doubtful loans. This itself is partly a result of their need for volume of business. They attempt to protect themselves by charging interest rates high enough to cover the extra risk. But they seldom charge enough, with the result that when loans are not paid in a period of depression, many such banks are unable to weather the storm.

There are certain services which are clearly recognized as requiring a large volume of business, not only in the interest of economy and quality of service, but in order to obtain the security that comes with spreading risks over more business. Among these services are the carrying of reserves, the rediscounting of commercial paper, the clearing of checks, the marketing of commercial paper and securities, and most kinds of insurance. The agencies for rendering these services are therefore found only in

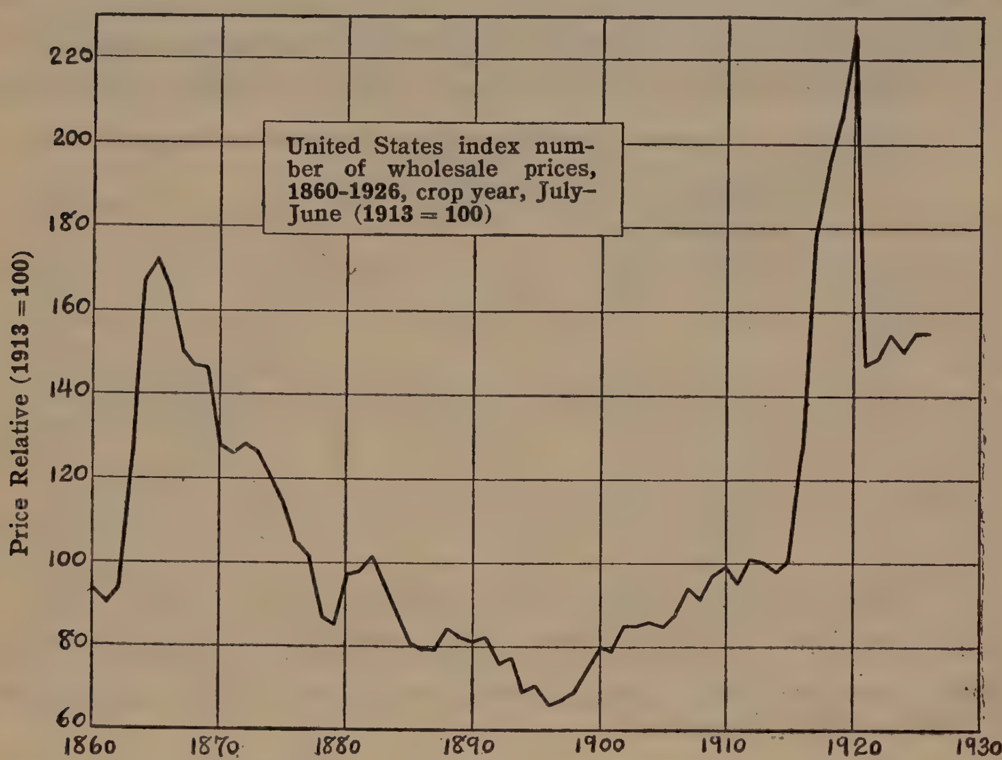


FIG. LIX. Changes in the Level of Wholesale Prices in the United States from 1860 to 1926

From 1890 to 1926 the "all commodities" index number of the Bureau of Labor Statistics is used. For the years 1890 to 1912, the "new" index number, using 1909 weights, is used; since 1912 the revised index number, using 1919 weights. For the years 1869 to 1889, Snyder's geometric means index number (*Review of Economic Statistics*, April, 1924, p. 105), is used, and from 1860 to 1868, Mitchell's medians (*Gold, Prices, and Wages*, p. 23).

the larger cities. Congress recognized the importance of this when it set up the Federal Reserve, Farm Loan and Intermediate Credit Systems. There are other services which need rendering upon so limited a scale that only in the very largest commercial centers is enough of it concentrated to keep a special agency busy. Foreign exchange is an extreme example of this; stock brokerage another. In all other cities, this service is carried on as a side line

of commercial banks, oftentimes on an agency basis. Cities have to be of a certain size before they can support savings banks and trust companies as separate institutions.

The two outstanding weaknesses of our financial organization at present are its inability to prevent severe changes in the price level, and the insecurity of the commercial banks. Three types of price level changes occur, first, the long upward and downward trends continuing over several decades, second, the sharp breaks that accompany wars and the like, and third, the temporary rises and declines that occur in periods of business expansion and recession. Figure LIX shows the first and second of these. Between

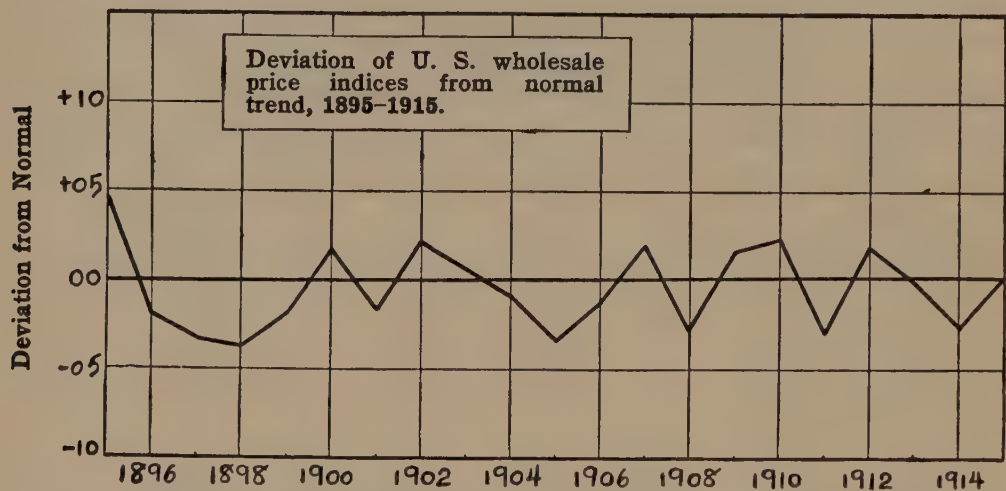


FIG. LX. Variations in Prices, Shown only as Departures from the Trend.

(Price deviations from a trend, fitted by the method of least squares from 1897 to 1915, inclusive.)

1870 and 1896, the price level declined from 128 to 66; between 1896 and 1915, it rose from 66 to 101. Figure LX shows the temporary fluctuations separated out from the other two. All three of these types of price movements are great evils. They make business very uncertain and lessen the usefulness of money as a standard of value and particularly as a standard of deferred payments.

SUGGESTIONS FOR FURTHER READING

For a general discussion of the theory of exchange and of certain of the financial organizations, the reader is referred to F. W. Taussig's *Principles of Economics* (1921), Book III and Book IV, Chapters 32 and 33; to R. T. Ely's *Outlines of Economics* (1919), Book II, Chapters XIV to XVII, and Chapter XXVII; to Raymond T. Bye's *Principles of Economics* (1924), Chapters 11, 12, 13 and 14; to F. M. Taylor's *Principles of Economics* (1921), Chapters XII, XIII and XIV.

A more detailed treatment of financial organization is found in Harold G. Moulton's *Financial Organization of Society* (1925), and in *Principles of Money and Banking* by the same writer. Other similar references are J. T. Holdsworth's *Money and Banking* and C. H. Phillips' *Readings in Money and Banking*. No attempt is made to give particular references to these books. Almost all phases of exchange are covered and the reader is advised to consult the tables of contents.

For reference on particular phases of the financial organization of society, consult Claude L. Benner's *The Federal Intermediate Credit System* (1926); J. B. Morman's *Farm Credits in the United States and Canada* (1924); C. O. Hardy's *Risk and Risk-Bearing* (1923), Chapters XIII and XIV; and H. Parker Willis' *The Federal Reserve System*.

PROBLEMS

1. Which is of greater importance in the conduct of business affairs, currency or bank credit?
2. Why would a bimetallic currency be unsatisfactory for this country? If Congress should establish a coinage ratio of 16 to 1, what would happen if the market ratio should become 15 to 1? 17 to 1?
3. What is meant by a "commercial" loan?
4. Make a chart of the *commercial* credit mechanism of the United States.
5. In what ways has the Federal Reserve System been of benefit to the banking and commercial organizations of the United States?
6. Why did Congress establish twelve regional banks without a single central bank?
7. What is meant by an "unfavorable" trade balance? A "favorable" trade balance?
8. "Exports cannot exceed imports over a period unless we are giving away our commodities." Is this true?
9. What is meant by the "gold points"?
10. Why was the Federal Farm Loan System established?
11. What is the purpose of the Federal Intermediate Credit System?
12. Why have not coöperative credit societies flourished in this country as they have in Europe?
13. The descriptive phrase "department store banking" has been applied to the activities of the combined commercial bank and the trust company. Why?
14. What kind of business operations do each of the following institutions finance?
    a. Commercial bank.
    b. Investment bank.
    c. Insurance companies.
    d. Savings banks.
    e. Trust companies.
    f. Federal Farm Loan System.
    g. Agricultural credit corporations.
    h. Building and loan associations.

CHAPTER XXVI

MARKETING ORGANIZATION

Chapter XXIV described in general terms the mechanism for the exchange of commodities, including the part played in such exchange by money and credit, and made brief reference to the other types of exchange, namely, the exchange of labor, of real estate and of loanable funds and securities. Chapter XXV took up in more detail the financial part of this mechanism. It is the purpose of this chapter to analyze in more detail that part of the mechanism which has to do with the commodities themselves, the labor, the real estate, and the loanable funds and securities. Money and credit are after all only instrumentalities in the exchange process. The actual exchange of commodities involves primarily a change in their ownership, but usually also the transporting of them, and frequently also the conditioning of them in one way or another. The ownership of goods always means the physical holding or storage of them. Since the ultimate exchange is between the primary producers of these and the consumers, someone must hold for a considerable time those goods which mature only at one season of the year, like most farm crops, and all goods for at least a little while. The exchange of immovables involves simply a change in their ownership. The exchange of services usually requires the joint presence or contact of some kind or other of the parties to the exchange, and this usually requires that one or both parties shall transport themselves or be transported to a place of meeting. The introduction of the telephone and the radio has changed this requirement somewhat.

I. THE EXCHANGE OF COMMODITIES

An important part of the mechanism involved in the exchange of commodities is that which provides the transportation, storage and communication. The discussion of this is as far as possible reserved for a special chapter following.

Types of Operations Involved.—In taking up the more detailed analysis of the exchange of commodities, let us think of it as a

process, as the process of getting the commodities from the primary producers into the hands of the final consumers, and then break up this process into its *operations* or *activities*. These operations may for the most part be looked upon as *steps*, since they come after each other in the exchange process. But many of the operations occur at several points in the process. For example, if the goods pass through several hands, as is usually the case, they are likely to be sold, bought, transported and perhaps stored several times.

The customary procedure for writers in the field of marketing is to put all this selling wherever done into one category called the "*selling function*," all the buying into another called the "*buying function*," etc. Naturally the number of categories will vary greatly according to those who are making them. For example, some think of advertising as a separate function, and some include it with selling. Some think of the quoting of the market price, such as done by the government, or trade boards or trade journals, as a separate function, and some classify it along with buying or selling or inspection or what not.[1] Let us avoid this whole question of classification and think rather of the operations or activities which make up the exchange process. Our criterion as to what constitutes an operation will be actual marketing organization. We shall designate as separate operations those which have in general or at times come to be executed by distinct types of business units. Thus we shall list advertising as a separate activity because it is now in considerable part handled by special advertising agencies.

The two most obvious activities connected with exchange are *selling* and *buying*. Selling is done in the first instance by the primary producers, and then by a long line of middlemen, including commission merchants, brokers, processers, jobbers and retailers. Buying is done at the end of the line by the final consumers, and on the way to the consumers by processers, jobbers, retailers and others. The jobber is a "dealer" or merchant; that is, he buys the goods that he sells. True commission merchants and brokers never own the goods they sell, and hence never buy. Their business is to sell goods for others for a fee, sometimes calculated on a per-

[1] Professor Fred E. Clark classifies what he calls the "marketing functions" under seven heads; three of these, however, are designated as only "auxiliary functions." See his *Principles of Marketing*, p. 28. Professor B. H. Hibbard has a somewhat different list with nine in it. See his *Marketing Agricultural Products*, p. 34.

centage or commission basis, at other times as a flat rate per hundredweight or the like. The broker handles goods in larger lots and for a smaller fee than the commission merchant, and ordinarily has no warehouse facilities whatever. The commission merchant is nearest to the primary producer in the marketing chain.

Buying and selling are themselves complexes of other activities sometimes separately executed. First of all, the buyer must decide what to buy, and when to buy it. Then when he sets out to buy, he has to find the goods he wants, and the owners of them. If he is going to be sure of getting what he wants, he must inspect the goods very carefully before buying them. Then he bargains with the seller and finally comes to agreement with him as to price and other terms of sale. Finally the money must be paid or credit arranged in lieu of it, and the goods delivered. The credit arrangements may involve calling upon a bank for a loan. The delivering of the goods may involve transportation in one form or another. Delivery may not be wanted for sometime, so that storage will have to be provided. Some risk of loss in quality or decline in price may be involved in this holding in storage. Moreover, a buyer does not ordinarily buy one thing or one lot only. Take the retail merchant as an example. What he does is to assemble in one place an assortment of goods that he thinks his customers will want. He assembles heat, light, and services of various kinds along with the goods. Judgment is a very important part of assembling. The success of a retailer depends in large part upon his judgment in choosing what to buy and how much of it. This is equally true for the jobber. Whatever he assembles unwisely he will probably sell to the retailers some time later at a loss. The housewife is similarly an important assembler of goods and services. She calls upon the grocer for one kind of goods; the meat dealer for another, the milkman for another, the fuel dealer for another, the drygoods merchant for another, the furniture dealer for another, and out of them all assembles a home, perhaps a highly inviting one, perhaps quite the contrary, depending among other things upon the judgment she uses in selecting what to bring together. One of the activities associated with buying in most cases is therefore assembling, this being understood not as the physical act of bringing goods together in one place, which is transportation, but as the choosing of what to bring together, and when, and how much of it.

When exchange is looked upon from the selling side, an even larger complex of activities appears. There is first of all the choice of when to sell and where. If a large lot of goods is to be sold, it must be distributed or dispersed to various markets or buyers. Judgment is required in this operation, as to how to break up the lot, and how much to send to each place. This operation of dispersion is thus the counterpart on the selling side of assembling on the buying side. Like assembling, it must not be understood as a physical act. It is not the physical act of separating goods, but rather the choosing of how to separate them. But selling frequently involves assembling also. For example, a group of farmers assemble their produce and offer it for sale in a public market; or their live stock into a car and ship it to a central market to be sold for them by a commission merchant. In this case, both farmers and commission merchants are doing assembling, the commission merchants on a larger scale than farmers because they receive live stock from many groups of farmers. Brokers assemble on an even larger scale than commission merchants.

The largest assembling activities carried on by sellers are those of our coöperative marketing organization, especially of those which operate in the central markets, assembling goods from over a wide producing area, then dispersing them to many markets. Whenever buying is done coöperatively, there is always the possibility of buying and dispersal being associated with each other.

In the case of both selling and buying, but especially selling, it is frequently advisable to do more than simply go out and look for buyers—it pays to develop new buyers and sellers, and also increase the volume of business done with old customers. The conventional method of doing this is to advertise. There are many well recognized forms of advertising besides newspaper and magazine advertising; for example, billboard, poster and car-card advertising; also circular letters, window displays, exhibits and the like. The same sort of results may be obtained by sending out traveling representatives. A traveling salesman working on a regular beat makes developing new buyers as much a part of his work as selling to old customers. The same combination is made in the case of mail-order selling. But in the business world to-day, it is increasingly the practice to set up advertising or "demand-creation," as it is sometimes called, as a separate activity, going along with selling and assisting and supplementing it,

but none the less different in actual administration. Advertising and the actual selling are rather generally separate divisions of the "sales department." Much of the advertising work of to-day is handled by separate advertising agencies.

Businesses which are in the field as buyers of goods rather than as sellers, like many small dealers in country produce, or as receivers of goods for the purpose of selling them for a fee, like commission merchants and brokers, also resort to advertising, sometimes to supplement the work of traveling representatives, at other times as a sole means of developing new sources of commodities. Advertising is therefore at times as much a part of buying as of selling.

Of the other operations that are closely associated with buying and selling, there is first of all *transportation*, arranged by sellers much more frequently than by buyers. The traffic department, whose principal duty is the routing of shipments, is an important department of any selling organization. *Storage* is provided by sellers as much as by buyers. Primary producers commonly hold goods waiting for an opportunity to sell. Retail merchants must be sure to have the goods on hand when the customer calls for them. They must also offer some chance for selection. This means maintaining a considerable stock of goods. In the case of dealers, it is difficult to say whether they are holding the goods as buyers or as sellers. When sellers hold goods in storage, they must assume the *risks* associated therewith, or else pay an insurance agency for doing it. Sellers also furnish a great deal of *credit*, all the way from the primary producer, who sells to dealers on credit, to the retail merchant who sells to the final consumer on credit.

Which of these operations associated with buying and selling shall we designate as separate activities because sometimes performed by distinct types of business agencies? *Buying* and *selling* we are already agreed upon. There is no question about *transportation.* Railway companies, steamship companies, express companies, street car companies, motor truck and motor bus companies, taxicab companies, and drayage and trucking companies are all common types of special transportation agencies. Nor is there any question about *storage.* It is less frequently handled by separate agencies than transportation; but still there is in the aggregate a large number of business concerns in the

United States whose principal function or one of whose principal functions is holding goods in storage. Some of these provide cold storage for perishable goods; others frostproof storage, others dry storage; others fireproof storage, etc. Risk-taking is separately handled by two types of agencies, namely, insurance companies, and speculators. We have already made a good case for *advertising* as a separate activity, although it may in actual practice be closely associated with buying or with selling.[1] The question of *assembling* is not so easily settled. One has a choice between saying that it is a necessary part of buying and selling, and therefore included in them, like bargaining and settling upon the price and paying for the goods and the like, or else naming it as separate activity from buying and selling. One thing is certain, it cannot be identified with either buying or selling alone, for it is often a part of selling as well as of buying. The only agencies performing it as a separate activity are the so-called shipping associations which let commission merchants do their selling for them. *Dispersing* is the same sort of a marketing operation as assembling, but much more clearly identified with selling than with buying; and only in rare cases performed as a separate marketing activity.

To the foregoing list of exchange activities must surely be added many others which have come to have separate entities in the business world. *Processing* and *conditioning* are usually named as separate marketing operations. Processing is not clearly separable from ordinary manufacturing. The milling of wheat and baking of bread we look upon as manufacturing; perhaps also the making of butter, although there is some difference of opinion in this case. The pasteurizing of milk is always looked upon as processing; likewise the curing of raisins, the artificial coloring or ripening of fruit, reducing the moisture content of grain, and cleaning or mixing grain. The term conditioning is also applied to such operations as the last three mentioned. Grain sometimes has to be dried or conditioned at a terminal port before it can be shipped safely in an ocean vessel. Cars of potatoes or fruit that

[1] To be entirely consistent in our analysis, we would probably need to break up advertising into parts according to actual developments in the business world. There are some advertising agencies which merely act as brokers, arranging contracts between advertisers and magazines, newspapers, and the other sellers of advertising space. There are other agencies which in addition prepare the advertising copy. And to-day special research agencies are coming into existence which attempt to furnish dependable information to be included in advertising copy.

have not withstood shipment very well need to be conditioned before they are offered for sale. Whether a given operation will be called manufacturing or processing depends somewhat upon the simplicity of it and to what extent it changes the nature of the product, but more upon whether it is performed as an incident to marketing by some recognized middleman agency, such as a milk distributor, a jobbing house or a terminal warehouse. It is because the local creamery is often looked upon by farmers as merely an agency for marketing the butterfat, that the making of butter may be called processing even though it changes greatly the physical nature of the product. In some cases, however, operations of this kind performed by special business agencies set up apart from the middlemen agencies are still called processing. The drying of tobacco, the evaporating of fruit, and perhaps the ginning of cotton are cases in point.

Closely allied to processing is *packaging*, also named by some as a separate marketing operation. It is always done by the sellers and as an incident to selling operations. It would be difficult to find many cases of separate business agencies set up solely for this purpose. Perhaps the hay baler is a case in point. Cotton is baled as an incident to its ginning. Manufactured goods are usually packaged by the makers; farm products, by the processers and jobbers. In these days of branded goods and kitchenette apartments, packaging is becoming increasingly important.

Sorting, *grading* and *standardization* are also closely associated with processing. Sorting refers more particularly to the inspection of the goods and discarding of non-marketable portions of them; grading, to the separating of the goods into definite classes according to size, color or other qualities; and standardization, to securing as much uniformity as possible in the product or each grade or class of the product. Distinction is sometimes made between a *grade* and a *class*. Grades are likely to be based on quality differences, such as size, weight, percentage of important ingredients (such as protein, acidity, etc.), freshness, freedom from blemish or impurities; class, on fundamental differences in type, such as species, variety, sex, design and the like. Thus lumber is first of all put into the classes hardwood and softwood. Then each of these classes has numerous subclasses according to species. The grades of lumber are based principally upon how free it is of knots and other defects. Standardization can be se-

cured in part by careful sorting and close grading; but a high degree of it requires going back to the manufacturing or growing processes. Manufactured products can be very highly standardized without great difficulty simply by selecting raw materials carefully and controlling the technical processes of manufacturing; not so farm products—nature is too uncertain. It is therefore apparent that standardization and its allied operations are closely identified with primary production. The first sorting of farm products must usually be done on the farm. The rest of it is identified with selling, as an incident to the usual activities of commission merchants, jobbers, warehousemen, etc. Very rarely is it a specialized activity of particular business units.

Inspecting, on the other hand, is frequently a specialized activity. It includes examining commodities and reporting upon their grade, class and condition. Generally it is performed by public agencies or agencies operating under public supervision. Either shippers or purchasers may ask for government inspection and grading of a car of potatoes at shipping point, en route, or upon its arrival at destination. Much of the butter now shipped from Minnesota is inspected in Minneapolis and frequently also at destination. Grain is almost always inspected in the central market. If either party is not satisfied with the grading of a car, in the case of grain and some other commodities, a reinspection by a "board of appeals" can be demanded. Official inspection is being extended to more and more commodities each year. Selling subject to official inspection is coming to be the prevailing practice with many commodities.

In the case of selling organizations, especially of the coöperative type, inspection takes the form of giving a grade and class to a supply of a commodity which has been intrusted to them to sell. This operation is also likely to be called "grading." Thus the tobacco from several hundred farmers may be assembled in one warehouse and each farmer's lot given a certain grade and class rating. At the same time, any lot of tobacco may actually be divided into several different grade lots for selling. Thus grading in the two senses of the term may be combined in one operation.

One of the most important of the specialized activities developed in connection with exchange is the providing of a market place where trading can be carried on under favorable conditions. This involves providing not only the physical facilities, such as

suitable building space and equipment, telegraph and telephone connections, etc., but also an organization that will enforce rules insuring fair dealing. Nearly all staple commodities to-day have "*exchanges*" or "*boards of trade*" in important markets all over the world. Most cities of any size also have "public markets" to which farmers bring local produce to sell direct to consumers or to dealers of various kinds. Some of these markets are owned and managed by the city, some by private interests, some by organizations of dealers or farmers.

Market news reporting has now become a specialized activity, sometimes carried on by public agencies, sometimes by trade journals and other private reporting agencies, sometimes by exchange or board of trade organizations—in many markets by all three of them. More and more of this work is passing into the hands of public agencies. The market information reported covers a wide range of subjects, most important of these being prices, receipts, sales, and condition of demand in the different markets; carloadings at different points and carlot movements, movements of cargoes; acreage and condition of forthcoming crops and volume of production in all competing countries so far as possible; forthcoming production of manufactured products; and all other information relating to the foregoing. Collecting this information requires a large staff of reporters who devote their full time to it, in addition to assistance from a very large number of business units. Some of the activities connected with this reporting have become sufficiently differentiated to be designated as specialized activities; for example, market price quoting, and crop and live stock reporting. After the news is collected, it must be disseminated. Newspapers and journals do much of this, and thus establish their contact with the exchange process. Special trade papers and journals are perhaps most important of all as spreaders of market news. For quick dissemination, the telegraph is widely used, and to-day also the radio.

This leads to the naming of *communication* as one of the most important special activities associated with exchange. A very large part of modern exchange is arranged by mail or over the telephone or telegraph. The spreading of the market news needed as a basis for arranging deals at long distance, is probably more important than the actual communication between the parties to the deal. A "perfect market" is one in which all the trading

parties are in possession instantaneously of all the information relating to all the transactions taking place. Markets have improved just exactly as rapidly as the means of communication of such information have improved.

The list of specialized exchange activities is hardly complete without mentioning still a few others that have become differentiated. For example, special business agencies have been set up for *collecting* unpaid accounts; likewise for determining the *credit rating* of customers; likewise for *collecting claims against railroads* for damage in transit and overcharges; likewise for a number of simple operations such as care of goods in transit, weighing, etc.

Types of Middlemen.—The discussion in this and the preceding chapter has named and described the work of most of the important middlemen agencies, of the wholesaler, the jobber, the broker, the commission merchant and the retailer. Of those still to mention in the field of manufacturing there is the *manufacturer's* or *seller's agent*, who sells on commission in the domestic market the products of a number of small factories, none with volume enough to warrant maintaining a sales organization of its own. Such an agent comes between the manufacturer and the jobber in the marketing chain. The most important other types of middlemen handling agricultural products are the *wholesale receivers*, the *country buyers* or *shippers*, the *traveling buyers*, all operating in the local market, and the auction company operating in the central market. The wholesale receivers buy from country shippers in carlots or less and sell to manufacturers or jobbers. In the language of the street, they are "dealers" or "merchants." They are in a way an alternative for the commission merchants. Many wholesale receivers are nothing but commission merchants who as a result of competition and other influences, have gradually changed from selling on commission to buying on their own account. Manufacturers handling too small a business to warrant maintaining a buying organization are likely to depend upon wholesale receivers or merchants for their supplies of raw materials. Thus to-day many small country mills buy part or all of their grain from grain merchants in the central markets. Woolen manufacturers rather generally buy from "wool merchants." Buying in the country market is done by resident buying agencies, such as grain elevators, live stock buyers and retail stores, or by traveling buyers who are on hand only for the season or intermittently.

Either of these may be operating as dealers, buying for themselves and then shipping; or they may be buying for a wholesale receiver or jobber or manufacturer. Coöperative shipping associations frequently take the place of country buyers of all kinds. The local grain elevator illustrates all three of these arrangements. It may be an " independent," that is, privately owned and operated; a " line elevator," that is, merely buying for a terminal market " grain company," which is a wholesale receiver; or it may be a " coöperative," that is, in effect selling through a central market commission company. Auction companies operate in the central market as intermediaries between wholesale receivers and commission merchants on the one hand, and jobbers on the other hand. Retailers and hucksters also buy at auction at times. Coöperative associations may ship directly to auction companies, thus eliminating the wholesale receivers.

Types of Markets.—Frequent mention has already been made of the *local market*, the *central* or *wholesale market*, and the *retail market.* There remains to name only the *secondary wholesale or jobbing market*, and the *seaboard market.* The local market is the first and smallest assembling point of the commodities produced in an area. Ordinarily there is a surplus of one or more commodities to be forwarded to some larger central market. In the central market, the supply of any product is likely to reach its maximum concentration. From here it is dispersed to the seaboard market for export—oftentimes a seaboard market is also a central market—or to a secondary wholesale market for further dispersion to local retail markets, or to manufacturers in the central market and surrounding territory. If the commodity in question is one which is imported, like coffee, the distribution is from the seaboard market to the central market to the secondary wholesale or jobbing market to the retail market. No market, of course, is of one pure type. All markets have some retailing, and nearly all have some local receiving. All central markets are in part jobbing markets.

The Commodity Exchanges.—An exchange may be defined as a " traders' organization which maintains an exchange hall and other trading facilities for its members, regulates the methods of trading, and prescribes certain requirements for the admission of new members."[1] Commodity exchanges have come to play an important part in the marketing of many products.

[1] Edmund Brown Jr., *Marketing*, 1925, p. 233.

The commodities which are now traded in upon organized exchanges are wheat, corn, rye, barley, oats, flaxseed, rice, alfalfa, timothy, alsike, kafir corn, cotton, hay, live stock, sugar, coffee, pork products, butter, eggs, cottonseed oil, fruits and vegetables, rubber, cocoa, metals, and perhaps others of less importance. The most highly organized exchanges offer facilities for future trading, that is, buying and selling for delivery at a future date. There are at present ten exchanges licensed by the United States Department of Agriculture to carry on future trading in grain. There are two at Chicago, and one each at Minneapolis, Duluth, Milwaukee, Kansas City, St. Louis, San Francisco, Los Angeles and Baltimore. In practically all of these exchanges, there is active future trading in the common cereal grains such as wheat, rye, oats, barley and corn; and in Duluth and Minneapolis, flaxseed futures are bought and sold in addition, and in Kansas City, kafir corn in addition. Future trading in rice is carried on at New Orleans, and in alfalfa, alsike and timothy seed at Toledo. New York, Chicago and New Orleans maintain future markets in cotton. Other commodities in which there are future markets are sugar, coffee, cottonseed oil, pork products, butter and eggs. The exchanges dealing in these commodities are located at either New York, Chicago or New Orleans. Each point which provides a future market has also an active "cash" or "spot" market for the different commodities. Organized exchanges have been formed at many other points, but they restrict their dealings to cash sales. The live stock exchanges located at many cities are of this type. There are ten designated "spot" markets for cotton distributed throughout the cotton belt. The exchanges organized to deal in fruits and vegetables, of which there are about fifteen, do not deal in futures, nor do the metals and cocoa exchanges.

The commodity exchanges have been organized to regulate the marketing activities of the dealers at the important markets. Practically all of them are incorporated bodies with varying degrees of membership restriction. Some limit the number of members, others restrict the number by requiring large initiation fees, while others require only nominal fees and have practically unlimited membership. In the larger and more active exchanges with restricted membership, "seats" on the exchange acquire a high monetary value, sometimes selling for many thousands of dollars.

The exchanges maintain trading rooms or buildings where the members gather each business day and make their purchases and sales. Especial effort is made, particularly on the more important exchanges, to maintain continuous contact by means of telegraph, telephone and cable with all of the important markets of the world. Traders are thus informed of all activities and events which may have an influence upon the prices of the commodities. The more important exchanges therefore approximate a perfect market.

Other activities of the exchange are establishing rules for the conduct of trade, arbitrating disputes, enforcing ethical dealings between members, and furnishing market information to the public. Such questions as commission charges, the extension of credit to customers of the members, and giving rebates to customers, are all rigidly governed by the more firmly established exchanges.

One of the most important services rendered by exchanges has to do with the shifting of risk discussed in Chapter XXIII. The exchanges are able to assist in this because they provide a continuous market, making it possible for a person to buy or sell any amount of a product dealt in on the exchange at any time. There is always present a body of dealers ready and willing to buy or sell if it is made advantageous for them to do so. With such a market available, a producer knows that he will be able to sell his output of his commodity at any time, and that he will never be forced to store the product against his will because of lack of a market. Similarly the buyer, in this case the person who uses the product for further processing or for distribution to dealers, or to the ultimate consumer in the case of butter, eggs, fruits and vegetables, knows that there is a continuous supply available at regularly quoted prices. His operations will not be disturbed because of inability to secure the necessary produce. The trends of the prices in these markets furnish him with information on which to base his production program. Thus the risks entailed in uncertainty as to sources of supply and probable prices are largely avoided.

The establishment of future trading by exchanges still further assists in the shifting of risks to specialists willing to assume it, in the manner already discussed in Chapter XXIV. Other phases of it will be discussed elsewhere in the present chapter.

Combination by Operations and by Commodities.—The fundamental issues involved in marketing organization require application of the principles of specialization and comparative advantage, particularly as these work out in terms of specialization by producing units and the combination of different types of enterprises, supplementary, complementary and by-product, in one producing unit. The marketing business unit in commodity marketing involves two types of combination, first, the combination of the different marketing operations, or services, as they will sometimes be called in this section of the chapter, and second, the combination of different commodities. The question of whether or not to set up a separate unit for rendering a certain marketing service or combination of marketing services depends in part also upon the volume of business that will be available and the relation between volume of business and profitable operation. Hence the principles relating to size of business are involved. Following are types of questions such as are involved in a production economics analysis of the problem: Shall there be a business unit in the central market performing one marketing function for one product? Or shall there be a unit rendering this and several other functions for this product? Shall a certain function be performed in the central market or in the jobbing market or in the retail market? Shall a given marketing unit handle only one product or a group of related products? At what points geographically is it feasible to establish marketing units of the various types? How many units and of what size shall there be in a given market?

Obviously it will be impossible in the space of this chapter to work out a detailed analysis for each of these questions. All that will be done is to indicate the principles involved. Let us begin this by considering the marketing of factory products such as clothing, shoes, canned goods, hardware and the like. Any one of the following lines of distribution is available to such goods in domestic trade:

Manufacturers direct to consumers through customer-to-customer canvassers or by mail.

Manufacturers to retailers through traveling salesmen or by mail.

Manufacturers to jobbers to retailers.

Manufacturers through selling agents to jobbers to retailers.

Manufacturers through brokers or commission houses to jobbers to retailers.

The first method of distribution gives the closest possible contact between the manufacturer and the consumer. Other things being the same, it will therefore persist. The first limitation is volume of business. A custom tailor can sell all of his output in this way to people who will call at his place of business. If he is to expand his business, however, he must send out salesmen, and eventually build up a large sales department. But immediately this were done, much of the personal contact so necessary in custom tailoring would be lost, and the small local tailors everywhere would out-compete him for business. He would have much closer contact than if he sold through jobbers and retailers; but his per-unit costs would be very high. If a manufacturer is turning out only one product, his per-unit costs of selling direct to users will be excessive unless the unit of sale is large. The goods commonly sold in this way, namely, typewriters, adding machines, automobiles and tractors, have rather high value per unit. Sewing machines and vacuum sweepers are sometimes sold in this way. We still have the book agent with us. He specializes in books which ordinarily would sell very slowly if at all through the regular channels, and works on high commissions. Even in most of the lines mentioned, the salesmen are settling down as resident salesmen and doing much of their selling out of local offices or stores. Farm machinery has illustrated this tendency. Time was when grain binders and cream separators were mostly sold by high-powered salesmen who came and went. To-day the local implement dealer waits at his place of business to sell whatever is wanted when the customer calls, and he carries a full line of tools and machinery and accessories and parts. He leaves his place of business only to make important sales. In other words, he has become a retailer. The advantage which the retailer enjoys is his larger line of goods and lower per-unit costs. He pays rent, but he has less traveling to do. The manufacturer no longer has an exclusive representative pushing his product and using the methods of high-powered salesmanship; but he is getting a larger share of the buyer's dollar. Direct selling is more and more being restricted to new products or specialty products requiring high-pressure salesmanship to move them.

Even selling to retailers is costly if a manufacturer has only one product to offer. For example, a manufacturer making only saws or hammers and selling to retailers, would have to pay his

salesmen high commissions if they were going to visit all the hardware merchants in all the little villages in his territory. To escape this, he would either have to begin manufacturing a fuller line of goods, or turn over his product to a hardware jobber. The hardware jobber can operate on lower margins because he handles a full line of goods needed by hardware merchants.

But even the jobber may not be enough of a connecting link. Most of the jobbing in the United States is done by local jobbers, which means jobbers operating in an area a few hundred miles each way at the most, and frequently of less than a hundred miles.[1] Now it is a long way from a manufacturer in Pittsburgh to local jobbers in Texas, Oregon, North Dakota and Maine. These local jobbers cannot maintain connections with all the manufacturers of all the articles sold in a modern hardware store. Think what a list it is—tools for every conceivable kind of work, cooking utensils, building parts, stoves, nails, wire, paints and varnishes, rope, twine, rubber hose, garden seeds, fertilizer, etc. Nor can the manufacturer of each of these articles maintain a staff of salesmen to visit the local jobbers. Three sorts of middleman agencies have come in to fill this gap. One is the " selling agent," sometimes also called the " manufacturers' sales agent," who sells on commission to the jobbers a group of closely related articles such as garden tools, or kitchen utensils, for a number of manufacturers. Usually these sales agents sell only one make or brand of any one article. Another middleman filling this gap in an important way is the *broker*, who ordinarily specializes in a single commodity, which he knows thoroughly, and acts merely to bring buyers and sellers together. He knows all the sources of his commodity, the quality of the goods from each source, most of the possible outlets for it, and the kinds of goods demanded by various buyers. He may represent either buyers or sellers. If he represents the sellers, he locates potential buyers for the goods his employers have to offer, and puts the two parties in touch with each other. He may actually arrange the sale, but usually not without confirmation from his employers in advance. Brokers' fees are usually small, from a fraction of a per cent up to 2 or

[1] There were, according to a survey made by the Curtis Publishing Company, over 3000 local jobbers handling groceries in the United States in 1915. About 300 of these were classed as " district " rather than local jobbers, indicating that they cover a larger territory. See Clark's *Principles of Marketing*, p.138.

3 per cent, or even higher in extreme cases. The fields in which brokers render the largest service are groceries, flour and related products, and canned goods of all kinds. They also help in the selling of sugar and some textile goods. Brokers sometimes work for selling agents in place of the manufacturers. In such cases, they make an additional link in the chain of distributors. The third type of middleman agency operating between the manufacturer and jobber is the *commission house*, sometimes called " selling house," which simply takes the product of a number of factories and sells it for a commission fee. Disposing its product through a commission house relieves a factory of most of its sales responsibilities. The selling house actually makes the sales, collects the bills and remits payments, doing all in its own name. In some lines, particularly cotton milling, the selling houses also assist in financing the small manufacturers.

We now have the complete chain of distribution for factory products before us. (There are still other differentiations and specializations, but they are of minor significance.) Some products go to the consumer over the more direct routes; some over the longer routes; and some over all degrees in between. The more indirect the route, the more specialization by operations, and hence the fewer operations performed by each middleman agency; but on the other hand, in general, the less specialization by commodities. The retailer handles a far larger assortment of goods than the manufacturer's representative who calls upon you to sell you an adding machine or " Real Silk Hosiery." The jobber usually handles a much larger assortment than the traveling salesman for a shoe manufacturing company. The selling agent is somewhat more specialized than the jobber; but less specialized than the traveling salesman. The broker and commission house are specialized by commodities, but each represents a considerable number of manufacturers. Thus there are two sorts of specialization and combination in conflict with each other here. What are the particular advantages and disadvantages of each?

Let us start in with the first combination in the chain, the retail store, as compared with the manufacturer's salesmen direct to users. The manufacturer's representatives by concentrating on one article soon become thoroughly masters of it, are able to demonstrate it skillfully, and to meet effectively all the objections to purchase advanced by prospects. But the salesmen have

to travel from customer to customer, and visit a good many on the way, perhaps waste considerable time upon those who do not buy. Articles which people will scarcely buy at all unless they are demonstrated to them, or which really need to be demonstrated in the home or at one's place of business, may sell for enough more when sold in this way to pay for the high cost of it and the wastes involved; but surely not the staple commodities like flour, sugar and soap which people are going to buy anyway, and whose consumption will be but little increased by strong selling methods. Many of these staple commodities could be bought in sufficient quantities at a time to warrant a visit at the house, but for various reasons housewives have formed the habit of buying in small quantities as needed. Bread, meat, milk, butter and eggs, fresh fruits and vegetables must be bought this way anyhow. If stores must be maintained for perishables, and deliveries made almost daily, then it is good economy to combine staple goods with them so as to realize the advantages of the supplementary relationship. The various lines of goods sold in a modern retail store represent supplementariness of enterprises carried to about the extreme limit. They are supplementary in the use of building space, equipment, labor, management and even supplies. The effect of this is to reduce per-unit costs greatly. There is the same supplementariness in the use of the consumer's time. People would not generally make trips to a store for one article if salesmen were willing to call at their doors and take their orders. But if they can do a full line of shopping at one trip, the case is different. Another important advantage of the retail store is that it is always there and tries to keep all its lines in stock all of the time. It is impossible for the house-to-house salesman to be on hand just when the goods are wanted. The retail store will not sell well the articles that need specially skilled or effective salesmenship; but the large bulk of consumer purchases are of articles which the consumer has to buy anyway, or can be induced to buy by a little effective advertising. It will be apparent from the foregoing that the gains from combination of commodities in a retail store more than offset the losses from less specialization for all recognized goods entering regularly into use. This does not mean that all such goods will be sold in this way, but that the method will surely predominate.

The jobbing house has the same advantage of combining in a supplementary way a large assortment of commodities. The

greatest saving is in the salaries and traveling expenses of the salesman. A salesman handling only baking powder would have to have a higher commission than one handling a full line of groceries. There are important savings in transportation also. The jobbing house receives its own shipments in carlots for the most part, and ships in much larger lots to retailers than any one manufacturer could. In spite of these advantages, however, there is to-day, as already stated, a tendency for manufacturers to " go around the jobber " in many lines and do their own selling to retailers. One of the reasons for this is that more and more manufacturing establishments have a volume of output sufficient to support a selling organization of their own. Manufacturers are also adopting increasingly the plan of making a fuller line of goods, so that their salesmen will have a larger line of goods to sell, or are themselves becoming jobbers for supplementary lines of goods which they do not manufacture. Thus a shoe manufacturer sells rubbers along with his shoes, buying them from the manufacturers. The meat-packing companies sell butter and cheese along with meat and meat products; and some of them have branched out into the handling of a rather full line of food products.

Perhaps the most important reason for this tendency for manufacturers to go around the jobbers is that they feel that they must control the selling as far toward the consumer as possible if they are themselves going to realize the benefits from the modern use of brands and advertising. Most advertising is pointed at the consumers. The assumption is that advertising will make the consumers demand the goods advertised. But with several middlemen between the manufacturer and the consumer, almost anything may happen to defeat such an assumption. For example, the jobber may urge some other brand " just as good " upon the retailer because he is making a larger margin on it. The jobber is not ordinarily willing to take a smaller margin on goods just because they are being advertised; and the manufacturers think that he should.

Those introducing new lines of goods are most likely to do their own selling. They find that jobbers are generally disposed to stick to the old lines, and that their advertising makes slow progress if they leave the selling to the jobbers.

The manufacturers who sell through jobbers are in general those who do not advertise very much. This means that they

are turning out a product and letting the jobbers get the credit and the blame for its good and bad qualities. Very often the jobbers put brands of their own upon such products. Obviously such manufacturers are somewhat at the mercy of their jobbers. Any time that they see fit, the jobbers can shift their brands to the product of some other factory, and then all the good work the manufacturers have done in improving their product has gone for naught. Under such circumstances, every once in a while an additional manufacturer gets the idea of adopting a brand of his own and advertising it and sending out his own salesman. Such a program is likely to be successful with goods used in large quantities and at the same time having distinction in quality, and with goods which for the foregoing and other reasons, lend themselves to being advertised successfully. If the commodity is one which can be sold over a wide area, the advertising will be more effective. Direct selling to retailers may be so effective that it increases volume of sales enough to offset the additional expenses involved. A specialized advertising and selling program concentrated heavily on a single line of goods may well introduce gains that more than offset the savings in costs from the combination of products by a jobbing house.

The broker represents a high degree of specialization by products, but combination only in the sense of being employed by many sellers or buyers at one time. He shows clearly the advantages of both. The first gives him his understanding and technique; the second his volume of business. His knowledge and understanding is of the market rather more than of his product. There is little supplementariness in his mode of business; but little is needed, for he has little fixed investment. The goods he handles are the sort that are consumed the year round. But he, like the jobber has little place in the selling of a product that lends itself well to advertising. The advertiser determines in advance where he will have his market—he does not then need a broker to go and find it for him. Manufacturers with a large volume of product are able to make their own contacts with jobbers; the function of the broker is to do combined service for many small manufacturers. The commission house fits into the scheme of things in much the same way as the broker.

The selling agent specializes to the extent of handling a group of related products and realizes the savings in per-unit expense

resulting from that degree of combination. He represents combination in the further sense of being employed by many manufacturers. He fits into an advertising program better than a broker because he pushes individual brands with the jobbers.

An important phase of specialization involved in such an analysis is that of the separation of the manufacturing and the selling functions. Establishments which sell through brokers, selling agents, or commission houses, scarcely need a sales department at all—the president or general manager can do all the selling. This permits greater concentration on the technical problems of production and the lowering of costs of manufacture. The establishments selling through jobbers need somewhat more sales machinery—especially if they try to connect with local jobbers over a wide area; and those selling direct to retailers or consumers need strongly organized sales departments, often with branch houses and district organizations. The very life of such an enterprise depends upon the effectiveness of its sales organization. Keeping an efficient manufacturing department and sales organization going at the same time, both on a sufficient scale to make direct selling economical, may tax the managerial capacity of an enterprise to the breaking point.

The same issue between combination by functions and by commodities appears if we take into purview that portion of our marketing system which has to do with getting products from farms and other small units concentrated into the hands of the wholesale receiver and manufacturer. Any product which is produced in sufficient quantity in an area to be handled by itself is likely to be so handled; live stock is a good example of this. Also any product which is distinct in type or has special handling problems is likely to be separately handled—milk and butter are examples of this. Products similar in nature, like the various small fruits and vegetables, especially if produced in limited quantity in any one area, are likely to be handled in combination with others. This will especially be true if they supplement each other by coming into the market in succession. Other combinations which are sometimes made are of potatoes and apples; butter, cheese, eggs and poultry; hay and grain, etc. These combinations may be in the local market only, or in the central market as well. Very frequently, also, both buying and selling are combined in one unit, as grain buying is with the selling of feed, flour and fuel

in many local grain elevators, or the buying of eggs, butter and other local produce with the selling of groceries.

The most important factor in determining the type of assembling unit and the location of it is the volume of product furnished by any one producer. If all farmers produced live stock in carloads, the first assembling unit would be in the central market—there would be no need for local buyers or shipping associations as at present. If creameries all produced carloads at a time, shipments would be made direct to wholesale receivers in large markets. When not enough local produce is available at one local market to make up a carload, as is true for eggs, poultry and the like, the first assembling may be done either by the local retail store or by a commission merchant in the nearest large market. In general, whenever there is a real job of assembling to be done in connection with the concentration of farm products, a specialist of some kind is sure to develop; but if the assembling is a simple problem, as in the case of carlot shipments, then no specialist appears.

In the buying of raw materials by manufacturers, a rather high degree of specialization by commodities necessarily maintains. A good deal of the buying is done in the central markets by buyers working on a salary basis. Thus the large mills buy their wheat in this way from the grain exchanges; the large meat-packers their live stock on the live stock exchanges. Others obtain their supplies through brokers who specialize as buyers' representatives. A manufacturer usually wants a uniform grade and type of raw materials, and he must be assured of his supply when he wants it. If there is a large central market in which to buy, he can easily make the selection he wants, and can be reasonably sure of a supply. If there is no such market, a broker steps in and acquaints himself with all the sources of supply of raw material and supplies each of his customers with exactly what is wanted. Here is an example of specialization in function and in commodity carried to a high degree, in order to serve more effectively a large number of buyers. Not only must the manufacturer be sure of his supply, but he also needs to know what it is going to cost him. Especially is this true when he names a scale of prices for his product to jobbers or salesmen before he manufactures it. He may meet this situation by buying up a supply of raw materials in advance of his needs, or by making contracts for future delivery. In the first case, he has to provide storage and stand the risks of price fluctuations,

fire, flood and other disasters. In the second case, the seller takes these responsibilities. The second plan is the one the manufacturer usually prefers; but unfortunately the primary producers of raw materials also usually prefer not to take the responsibility of carrying their product. Moreover, it is probably cheaper to store many products in the large central markets. Consequently specialists have developed who take over the storage and risk-taking functions. When such is the case, the primary producer is always able to find somebody willing to buy his product, and the manufacturer is always able to find someone who is willing to contract to deliver him his supply of raw material when he needs it. The specialists who take over this function are known by various names in various fields—merchants, terminal warehousemen, speculators, etc.

Small country manufacturers usually obtain their supplies simply by accepting delivery or contracting for it from producers in the surrounding territory. This is true of creameries, canning factories, sugar-beet factories and the like. Country flour mills, however, frequently need a larger supply or a better balanced supply than they can obtain locally, and hence buy part of their supply from grain merchants or through brokers. Other country plants—meat-packing plants, for example—send out buyers into the surrounding territory. The small cotton and woolen mills of the South, East and Middle West obtain their supplies from merchants or through brokers operating in the raw material markets.

Much more might be said about the combination of operations performed by the various middlemen agencies which have been mentioned. Financing, for example, could be considered more in detail. The financing of retailing is in considerable part assumed by jobbers. Many retailers could not continue in business at all if the jobbers did not advance them most of their stock of goods. These jobbers are in turn mostly financed by the banks. Grain commission merchants in the Northwest advance most of the funds that country elevators need in order to pay cash for the farmer's grain. These commission companies in turn obtain advances from large bankers. Many small mills of various kinds are still advanced their supplies of raw materials by merchants, who also take over their product. The outstanding reason for all such financing arrangements as the above is that the middle-

man in question has more complete control and can keep a closer check on the situation than could either a small local banker, or a large banker in a distant city.

A similar description could be presented for risk-taking, storage, processing, packaging, communication, market news and many other of the marketing activities. In general, they are performed by middlemen who can either combine them most economically with their other marketing activities, or who are so situated as to perform them better. Packaging, for example, is clearly a function which manufacturers can perform most advantageously in the case of a truly manufactured product, but which jobbers can do best in many other cases.

The Size of the Marketing Unit.—The individual marketing unit is generally a small unit. The principal exceptions to this are the department stores, the mail-order houses, and the various types of integrated marketing units, such as chain-store systems, line-elevator systems, and central market coöperative organizations. These latter, however, are essentially combinations of many small units. The selling departments of large manufacturing establishments which sell direct to retailers or consumers also surely represent large-scale marketing. But not only in numbers of units, but in volume of actual selling, the small units still dominate the field. To realize this, we need only to think of the probable half million of retail stores of various kinds in the United States and of the typical commission merchant, broker and selling agent. Even jobbing businesses are relatively small. A typical city of fifty thousand inhabitants in the United States usually has a score or more of small "wholesalers" or jobbers. The principal factors making marketing units small are the following:

1. Costs of hauling produce to the local market, perishability of product, etc. Every shipping point is therefore likely to have its own grain elevator and creamery. There were 167 creameries in Minnesota in 1919 located in the country away from shipping points at distances varying from 1 to 40 miles. Only a small proportion of the cheese factories in Wisconsin are located at shipping points. The raw material for butter is usually delivered as cream several times a week. The cream can be sour, but this is not desirable. The raw material of cheese is milk, delivered daily or twice daily. The milk must be sweet.

2. The conveniences of living close to a source of supplies, and

costs of delivering commodities long distances. This applies to retail stores, especially to grocery stores and meat shops. The convenience of living close to a retail store is a very important factor in determining their prevailing size. If a new store squeezes in between two others already established, many of the people living between will presently begin trading with the new store merely because it is nearer. They will start going to it to buy articles they must have when guests arrive unexpectedly, and presently will be ordering supplies from it over the telephone.

This same analysis applies in the case of a jobbing house, but not so pronouncedly.

3. Marketing businesses usually have a large capacity for management in proportion to the volume of business. This is because they involve constant contact with persons. A successful retailer has to give more or less individual attention to each of his customers. It will not do to deliver wilted vegetables to many of them more than once or twice in a month. Complaints must be attended to and mistakes adjusted. If Mrs. Johnson has guests for dinner and wants an especially nice roast, she must surely have it. If at the last moment she discovers that she forgot to order cream for the coffee, and has no one to send for it, her obliging grocer must come to the rescue. The extending of credit to customers also introduces a strong personal element.

These same human relationships exist between the traveling salesmen of a jobbing house and the retailers, and through them to the house itself. This is accentuated whenever the jobbing house furnishes a considerable part of the working capital for the retailer, as is frequently the case. There must be the same close attention to each individual customer and his wants. Brokers and selling agents are perhaps the extreme examples of the significance of the human relationship in marketing. Each one of them owes his existence as a middleman largely to the fact that he has demonstrated the value of such a relationship to a large number of customers.

4. Almost another way of stating the foregoing is to say that neither the product nor the raw materials of marketing enterprises are at all standardized. This brings out the contrast with modern large-scale manufacturing.

5. Differentiation by tasks cannot be advantageously carried very far in marketing business units.

6. There are few possibilities of using power and machinery.

7. Under all the above circumstances, management is not likely to be delegated with a high degree of success. Marketing enterprises which proceed to expand by delegating management find costs and wastes increasing too rapidly; or quality of service deteriorating.

It is very easy to demonstrate that very small units generally have higher per-unit costs and smaller total profits than the medium-sized units. Figures LXI and LXII illustrate this in the case of retail stores and country grain elevators. Figure LXI

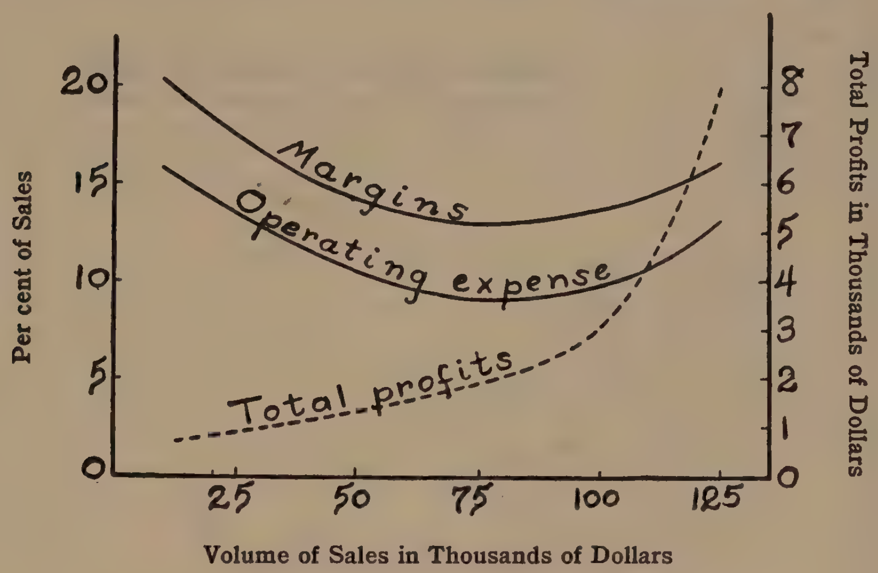


FIG. LXI. Margins, Expenses and Balances of Retail Stores. (Adapted from *What the Retailer does with the Consumer's Dollar*, by Theodore Macklin and P. E. McNall, Bulletin 324, University of Wisconsin Agricultural Experiment Station, 1921.)

shows the margins, expenses and total profits of 37 retail stores in Madison, Wisconsin. The smallest stores received the largest margin per dollar of sales. The expenses of the smaller stores were also higher than were the expenses of the larger stores. In spite of the fact that the net profit per dollar of sales was the smallest for the largest stores, their total net profit was the largest. The smallest stores had an average labor expense of 5.2 per cent of sales. Labor expense decreased to 4.1 per cent for the stores having sales between $50,000 and $100,000 and then increased to 6.8 per cent for the stores having sales of more than $100,000 annually. These data somewhat misrepresent the true condition, however, for the smaller stores used a considerable amount of

unpaid family labor while the largest stores hired all of their labor. The smaller stores paid 3.5 cents of each dollar of sales for rent, while the stores having sales between $50,000 and $100,000 paid only 1.2 cents per dollar of sales for rent. The largest stores paid 1.6 cents per dollar of sales. The remaining expenses also showed a like tendency to be higher for the small stores than for the larger stores.

Figure LXII presents similar results for 109 grain elevators in Minnesota in 1922–23. The costs ranged from 1.7 cents to 13.0

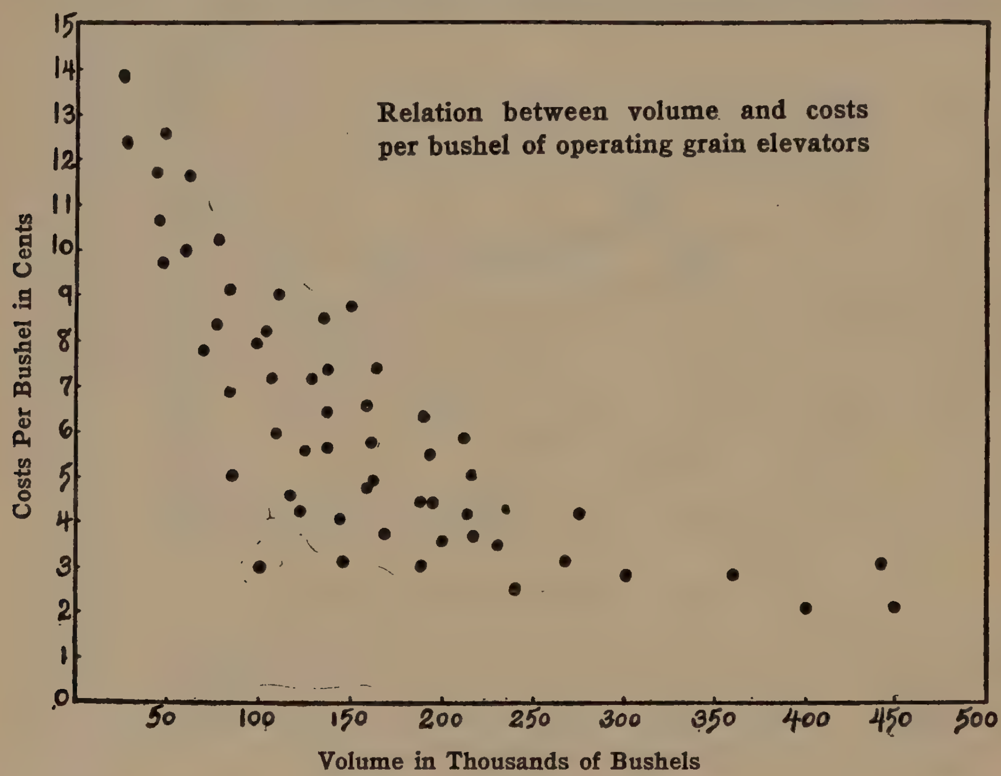


FIG. LXII. Relation Between Volume and Costs per Bushel of Operating Farmers' Elevators.

(*Management Problems of Farmers' Elevators*, by H. Bruce Price and Charles M. Arthur, University of Minnesota Agricultural Experiment Station, 1925. Figure 2.)

cents per bushel. The costs per bushel decreased rapidly as the volume of business handled increased to about 125,000 bushels per elevator, and more slowly thereafter. This is because the smaller elevators could increase their volume of business with relatively small additional costs. The building and equipment would be more fully utilized as well as the labor force. When a volume of about 125,000 bushels is reached, any additional volume probably requires additional machinery and labor and perhaps a

larger building. The additional costs of these, consisting of increased insurance, interest and upkeep, and higher managerial salaries, do not, however, increase as rapidly as volume, with the result that costs per bushel are still decreasing slightly with the largest elevators studied.

But how much larger could the stores become before the extra profits would not pay for the extra management required? Costs per dollar of sales are already increasing, and margins decreasing. Unless management is increased a great deal, the amount and quality of service which each customer receives will decrease. The increasing distance between the marginal customer and the store as the volume expands not only raises costs, but rapidly reduces the convenience of the service that goes with the goods. It is this latter factor principally that keeps grain elevators from getting larger.

Competition is expected to eliminate the inefficient and give the field to the efficient. It fails to do this very effectively in the case of marketing units. At least it does not keep down the number of marketing units. A new grocery store starting in a community usually gets enough patronage away from the old stores so that it can survive long enough to force the old ones to raise their margins a little; and then all of them are on the same level of competition. Meanwhile the consumers in the community have come to support one more marketing unit. If they appreciated that in patronizing the new store they were in effect probably stepping up the price of their groceries a notch, they would not do it; but they seldom realize this.

Department stores and mail-order houses, the two types of marketing units that have attained considerable size, owe this to special circumstances. The department store is a shopper's institution. It will prosper only if the city is large enough to send forth enough shoppers each day to make it feasible to keep a large assortment of goods on hand. People prefer trading in a department store because they can do all their shopping under one roof. Such stores make up for the loss of personal contact by carrying service to a remarkable degree in such forms as credit, delivery of goods, and privilege of returning goods. The difficulties of delegating management are partly overcome by an elaborate system of supervision and checking of employees. The costs of all this come high, but are partly offset by the economics of large-

scale buying. The department store exists because people are willing to bear extra costs for the sake of the shopping service they get.

Mail-order houses owe their existence largely to two things, first, that they are able to offer to people living in the open country and in small cities and villages a larger assortment of goods from which to select than is usually available in the local stores; and second, to economies in buying. The coming of the rural mail delivery and the parcel post made it easier for many farm people to "shop in Chicago" than in their local villages. No doubt local retailers have also assisted the mail-order houses greatly in their development. Professor Clark estimates that ten million people in the United States buy goods from the two large mail-order houses centered in Chicago.[1] Costs of selling by mail are likely to be high, but are offset by the economies in buying and certain other gains from large-scale operation and integration. Institutions of this size are able to carry specialization to an unusually high degree for marketing work. Most of their operations are reduced to routine and performed by low-priced workers.

Manufacturers' selling departments are large or small according to the volume of output of the factory. Unless part of the product is marketed in some other way, the volume of output can be no larger than the sales force can sell. Efficiency in manufacturing, or improvements in quality of the product, make selling easier and permit the selling organization to expand. Efficiency in the organization of the sales department resulting in better supervision of details, better trained or more enthusiastic salesmen, will increase the sales and permit the manufacturing to expand. Anything which limits the market area for the product, such as costs of transportation, will limit the sales department. As distance from the factory increases, competition will be keener, and more of a strain upon the management of the sales department. It should be added that the system of paying salesmen partly upon a commission basis is an important factor in the success of large-scale selling by manufacturers; it makes the salesmen partners to a certain extent in the enterprise.

The Internal Organization of the Marketing Unit.—An individual marketing unit like any other producing unit has its problems of internal organization, of proportion of the elements of

[1] *Principles of Marketing*, p. 224.

production, least-cost and highest-profit combination, proportion of enterprises, organization for operation, etc. All of the principles outlined under these heads in earlier chapters apply to marketing business units. The curve in Figure LXIII shows the variations in per-unit costs with size of business for 38 potato warehouses in

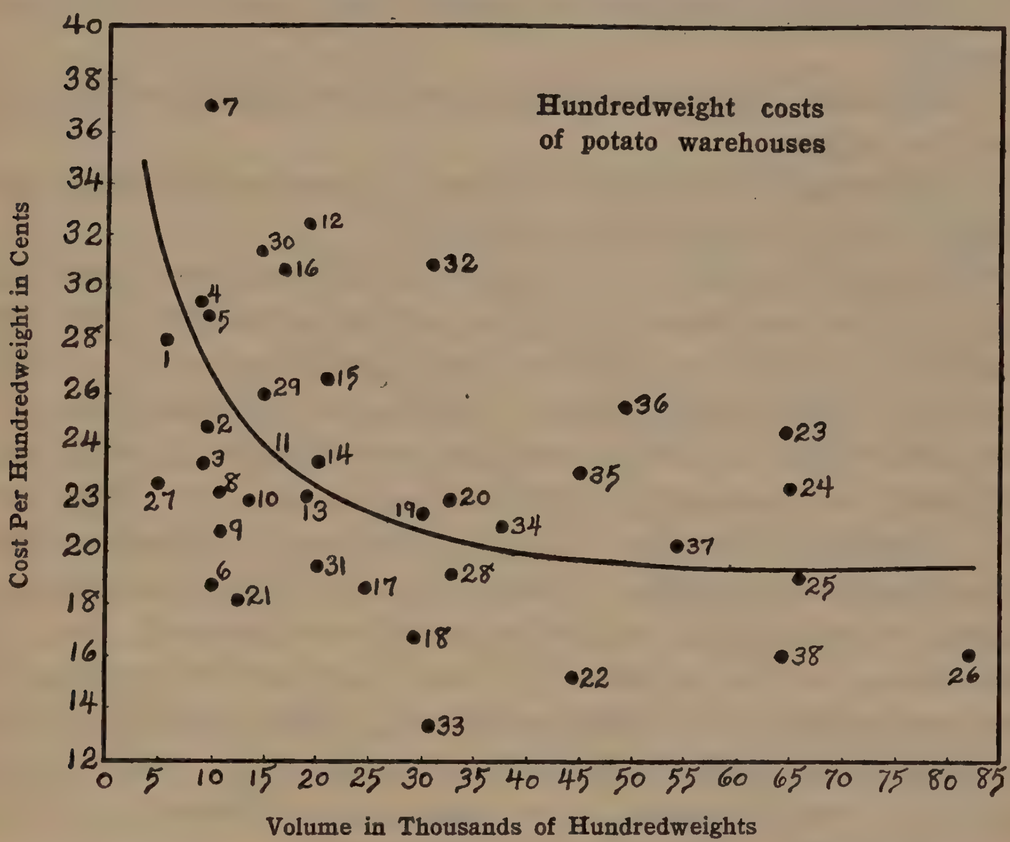


FIG. LXIII. Variations in Potato Warehouse Costs per Hundredweight of Potatoes with Volume of Business and for Other Reasons.[1]

Minnesota; and the location of the dots shows the variations from this average of the costs of the individual warehouses. Analyzed more closely, these variations will be found to be due to such things as the following:

1. Differences in salaries paid managers for the same volume of business.

2. Differences in amount of labor hired for the same volume of business.

3. Differences in rate of wages paid.

4. Difference in amount of equipment used for the same volume of business and in costs for the same type of equipment.

[1] J. D. Black, G. M. Peterson and B. A. Holt, *Minnesota Technical Bulletin No. 28*, Fig. 16.

5. Differences in kind of power used, and cost-rates of the same.

6. Differences in size of buildings and type of construction for same volume of business; also in costs for the same type of construction. Differences in volume of business for the same size of warehouse are usually expressed as differences in turnover.

7. Differences in amount of supplies used, and in prices paid for same.

8. Difference in insurance rates paid; also in interest rates on operating capital.

9. Differences in methods of selling; in services included in the selling; in care in handling the product, etc.

Warehouse Number 18 in Figure LXIII had very low costs principally because its building costs per hundredweight of potatoes handled were less than half the average building costs for warehouses having the same volume. Warehouses Numbers 32 and 36 have costs higher than the average because Number 32 paid a very high salary to its manager, while Number 36 had a very high labor cost. Number 35 also had very high labor costs, probably caused by inadequate equipment. Number 33 had low total costs largely because its managerial and selling costs were extremely low. In this manner, all the variations in total costs could be explained if data were available and time permitted. Many warehouses have low costs of one type but high costs of other types. High equipment cost usually results in low labor cost. Obviously a least-cost combination is involved in such a situation.

Still closer analysis would reduce each of the elements of production involved in the foregoing to data of inputs per unit of output. Then using the cost-rates applicable for each warehouse, one could calculate the combination of inputs that would give the lowest cost per hundredweight of potatoes. Given a definite middleman margin per hundredweight, say 25 cents, one could also calculate the highest-profit combination. If the margin changed with the inputs because of the effect of difference in inputs upon the amount or quality of the service, this would need to be taken into account.

Some of these warehouses are storing potatoes over the winter; some not. Storing may be looked upon as a supplementary enterprise. It should be undertaken whenever it adds to the net income more than it adds to the expenses. If the owner of the warehouse is operating it, he must consider whether the extra income is worth the extra effort he has to put forth. If the warehouse is coöper-

atively owned and operated, storage should be undertaken only when the extra expense of it is more than paid for in gain to the members from having their potatoes stored.

Some of the warehouses handle fertilizer, spray materials, feed and other supplies as a side line. This keeps the warehouse in use the year round, and also gives the owner or manager a steady occupation. It should be analyzed as storage was analyzed above —by balancing extra receipts or service against extra expenses and trouble of supervision.

If a retail store were taken as an example, the general analysis would be the same. The unit of output would probably have to be a dollar of sales. Inputs would have to be measured per dollar of sales. Amount or quality of service would be a large factor in input per dollar of sales. Turnover would also figure largely; both the stock of goods on hand at any one time and the rate at which they are sold affect all the inputs per dollar of sales, but especially the building and equipment inputs.

A marketing unit of the department store or mail-order type has in addition important problems of delegation of management, departmentizing, lines of authority and the like. The way in which these are solved affects both the per-unit costs and the profit combinations.

All marketing enterprises combining two or more commodities have the further internal problem of determining what commodities to handle and in what proportion to combine them. Department stores are of course expected to carry a full line of goods; yet if different stores are examined, a wide difference will be found in proportions of sales in different departments. Some build up strong ready-made clothing departments; others, strong shoe departments; others, strong rug departments; others, strong "bargain" departments, etc. Any department store must consider questions of this kind from the point of view of the long-time effect on receipts as balanced against expenses.

Most retail stores have less freedom than department stores in determining what lines to push—they must carry whatever goods their customers call for. In the outlying corner grocery stores of large cities, however, a considerable difference will be found in lines emphasized. Some attempt to compete with the downtown stores in green goods, butter, cheese, and canned goods; others carry only meager stocks of such goods. There are even larger

differences between drygoods stores. Many carry no men's ready-made suits and overcoats.

The selling departments of manufacturing organizations find organization for operation their major problem. There are pronounced differences between such departments in number and types of subdivisions, in degree of functionalization, and in systems for handling orders, making collections and paying their salesmen.

Relative Importance of Different Operations.—One can best obtain an idea as to the relative importance of the different types of marketing agencies and steps in the marketing process by seeing what costs or margins are associated with each of them. Studies designed to furnish such information have been made in large numbers in the last fifteen years. The results of these studies, however, because of differences in methods of analysis and in definition of terms, can be taken only as roughly comparable. Following are a few of the results of such studies:

A study of the expenses of country grain elevators in the Minneapolis district during the years 1917–23 showed that 6.0 cents per bushel was their average cost. The margin taken during the same period averaged 7.8 cents per bushel. The net profits were 1.8 cents per bushel.

The Federal Trade Commission found that the expenses of six terminal warehouses varied from 4.2 cents per bushel in 1912–13 to 12.8 cents per bushel in 1919–20. The margins taken during the same period averaged 6.7 cents to 19.1 cents per bushel. The Commission of Agricultural Inquiry found that the percentage margins taken in the terminal and local markets combined were as follows: for wheat, 7.8 per cent; corn, 16.1 per cent; oats, 8.4 per cent; barley, 11.9 per cent (of prices to buyers in central markets).

The United States Department of Agriculture reports that for 1922–23, the margins taken by various middlemen engaged in the production of bread in Minneapolis were: miller, 6.8 per cent; baker, 57 per cent; retailer, 16.7 per cent.

Central market margins on live stock in four markets in 1920–21 were 2.2 per cent of the selling price of cattle and 2.1 per cent of the selling price of hogs. In the same year, the middlemen (retailer and terminal market) received 26.5 per cent, packers, 5.8 per cent, and transportation, 3.6 per cent, respectively, of the consumer's dollar spent for fresh beef. The balance went to the primary producer on the farm.

During 1922–23, the United States Department of Agriculture found that middlemen (country buyers and city distributors) received 66 per cent of the selling price of Maine potatoes; 76 per cent of the selling price of Minnesota potatoes; and 71 per cent of the selling price of Wisconsin potatoes.[1]

The marketing costs and margins reported for some other types of commodities and selling agencies are as follows: for butter, 10 to 15 per cent to the retailer; 4 to 7 per cent to the jobber, 1 to 5 per cent to the receiver and 5 to 10 per cent to the shipper; for oranges, retailer, 33.3 per cent; jobber, 12.3 per cent, receiver, 2.6 per cent. Retail grocery store margins in studies made in 1920 varied from 10.5 to 26.0 per cent of sales. They averaged 16.9 per cent. Retail shoe store margins in similar studies made in 1918 averaged from 25.7 per cent to 34.8 per cent according to the quality of shoes handled. High-priced shoes yielded the larger margins. Retail hardware stores studied in 1919 averaged 26.5 per cent margins. The margin for wholesale grocery stores in 1918 reported by the Harvard Bureau of Business Research was 11.0 per cent. The average cost of retailing ranges from 20 per cent to 50 per cent of the consumer's price. There is less variation in margins among wholesalers than among retailers.[2]

Transportation is an important marketing cost. It takes from 25 per cent of the consumer's dollar for commodities such as California fruit, to as little as 3 per cent for furniture. Most agricultural commodities pay about 7 per cent of the consumer's price as transportation cost.

Advertising costs are somewhat smaller than transportation costs. The percentage of the sales used for advertising by various businesses was found to be as follows: groceries, 0.83 per cent; hardware, 1.12 per cent; vehicles and implements, 1.22 per cent; drugs, 1.76 per cent; department stores, 4.01 per cent; mail-order houses, 7.21 per cent.

II. THE EXCHANGE OF LABOR

The objective in this chapter is to discuss exchange organization. In the case of labor, this is nearly impossible, for the reason

[1] John D. Black and H. Bruce Price, *Costs and Margins in Marketing*, Annals of American Academy of Political and Social Science, January, 1925, Vol. CXVII, pp. 184 ff.

[2] Fred E. Clark, *Principles of Marketing* (1922), Chapter XXV.

that the labor market is largely unorganized. Most workers and work find each other without any exchange machinery whatever. The workers simply hunt for jobs until they find them. Factory employers expect to find a line of applicants for jobs waiting at their gates every morning, and from these to select what they want. Small employers may need to run a newspaper advertisement, or post a notice in their windows or on a bulletin board. Many others get jobs through their friends. If the waiting lines at factory gates begin to dwindle in some city because of the rapid growth of its industries, the local newspapers may publish stories purporting to show a great scarcity of labor and high wages. In the case of prospective farm labor shortages, the railroads may post bulletins in their passenger stations, or the employers may run advertisements in newspapers of other cities, or the employees may pass the word to their friends in other cities.

What organization there is mostly takes the form of employment offices or agencies, of which there are five types, the private fee-charging agencies, the employers' employment offices, the trade union employment offices, the philanthropic agencies, and the free public exchanges. The first type is by far the most common. Some of these agencies furnish a high quality of service. The registers maintained for engineers, bank clerks and nurses generally meet such a description. Some teachers' employment agencies are honestly and efficiently managed, but their fees are exorbitant. The agencies placing common labor, of which there may be a score or more in one city, are often not even honestly managed, and their fees are always high. They are usually located in the cheap lodging-house sections of cities and recruit their labor either from the migratory population of these districts, or from the foreign population groups. A good part of their business is with regular employers, such as the railroads, with whom they have standing agreements, sometimes exclusive, to supply all labor needed. They may on the one hand reach out and draw into their system certain leaders or local bosses among the foreign groups who make up gangs for them, and on the other hand enter into deals with job foremen, lodging-house keepers and the like. In the old days, the saloons figured largely in the system. The fees are liberal enough so that they can be split between the various parties involved in a deal and still leave enough for each; but oftentimes the fees are supplemented by various forms of graft such as margins

taken out of wages and board and lodging. The earnings in such a business depend upon the number of placements. The inducement, therefore, is always to get men started on new jobs. Even when they are free of graft, such agencies may do more harm than good because of their constant effort to keep men shifting from job to job. This was particularly true during the War when labor was scarce. Employers in some cities never knew how many of their men were likely to report the next morning. Many of the agencies employ labor scouts.

The offices maintained by groups of employers are in bad repute with workingmen because of the suspicions they have engendered as to their policies. Most employers, on the other hand, prefer not to depend upon trade union offices for their help. Consequently neither of these types of agencies has had much growth. The philanthropic agencies, such as maintained by the Y. M. C. A.'s, have seldom been able to live down the taint of charity. In the aggregate, however, they account for a large volume of placement, and the service is of a high order.

Most specialists in the field of labor are agreed that the work of bringing together the jobless man and the manless job should be handled by public agencies. There is even more general agreement on this subject in Europe than in the United States. They agree, also, that the service should be tax-supported and free to the worker. The United States Department of Labor in 1923 was cooperating with state authorities in the maintenance of 197 employment offices in 175 cities in 39 states. All of these were under state control and for the most part were financed by state appropriations. The service was definitely placed under the administration of the U. S. Department of Labor in 1924. In the month of December, 1925, the Illinois public offices referred 11,751 workers to positions. In January, 1926, the Wisconsin offices referred 6475 workers to positions; the Pennsylvania offices, 5707; and the Massachusetts offices, 3625. The average cost per placement for the public offices ranges from 20 cents to 50 cents, depending upon the number of placements. This can hardly be compared with the $1 and $2 fees commonly charged by the private agencies because a large proportion of the placing done by public employment offices is for odd jobs lasting only a few hours or days.

Public employment offices properly administered handle skilled and unskilled and male and female workers in separate depart-

ments. They keep records of individual workers and individual employers so that their placement constantly becomes more effective. They do the selecting themselves, send as many workers to a job as are asked for, and wait till the employer or the worker asks for further service before sending any more workers to the same job. Their objective is keeping the labor force of the community as fully occupied as possible, and hence they prefer that workers stay on their jobs and shift as seldom as possible. A public employment service properly developed will take upon itself such objectives as coöperating with city officials and commercial clubs in securing a better dovetailing of industries in the community, and coöperating with employers and workers in decreasing the labor turnover and in reducing seasonal and other unemployment. The value of the services of a public employment office is measured more by their success in fitting the right kind of worker to the right job than by the number of placements. It can properly be said that vocational guidance is one of the functions of a properly managed employment office.

In spite of the most heroic efforts of the employment offices in a city, unemployment may develop to an acute stage because of the shifts in industry which have already been described; or temporary unemployment may develop because of depression in important industries. Some procedure is therefore necessary for shifting workers from one city or district to another. This should be arranged by means of central clearing offices, possibly one in each state in each metropolitan area. Large cities with several offices may need local clearing offices.

Our present public employment service is far from being adequate. More offices should be established, and all of them should be more liberally financed. There is even more need for a properly organized clearing service. During the War, the demand for labor for the " essential " industries led to the establishment of a rather complete public employment service. Between January and October, 1918, a total of 832 new offices were opened. During the year 1918, these offices referred approximately four million persons to positions. Developed in haste, however, and in consequence never properly organized, the system failed to function very satisfactorily. Moreover, the employing classes have not generally looked with much favor upon a public employment service. They are glad to have additional workers brought to a

city, even though it may already have enough; but they seldom take kindly to having workers shifted to others districts or other industries. At any rate, the special appropriations for the employment service were discontinued in 1919, and most of the offices were closed. The prospects at present are that the service will be slowly expanded.

Fundamental to any real development along these lines is a change in public attitude toward the problem of unemployment. The public must get over the idea that a constant " reserve " of unemployed labor from which the employers are to make their selection is a normal and proper condition. Labor reserves cannot be judged like wheat reserves and wool reserves. Labor is perishable. It is wasted if the labor is not used. Furthermore, the laborer must live when he is not at work. From 1902 to 1917, the average unemployment in the United States was 9.9 per cent of the labor force. In 1914–15, it reached four and a half million workers, or 15.8 per cent. The index number of employment which the Bureau of Labor is now preparing uses the year 1923 as a base, calling employment in this year 100. Following are the index numbers of certain years since 1916 on this basis: 1916, 110; 1918, 114; 1919, 108; 1922, 88; 1923, 100; 1924, 90. The high point was 118 some time in 1920; the low point 77 in February, 1921. In 1925 it hovered around 92. The most recent report of the Bureau of Labor, for February, 1926, shows 28 per cent of the manufacturing establishments operating on part time, and the 71 per cent of full-time plants operating with only 87 per cent of a " normal " labor force. This is in a period when the newspapers and financial journals of the country are proclaiming unexampled industrial activity.

III. THE EXCHANGE OF REAL ESTATE

Real estate transactions may involve land only, buildings only, or land and buildings combined. They may involve outright sale and purchase, or merely rental. Some use is also made of options to purchase. The buyer of real estate like any other buyer obtains title to all future uses of it. In the case of real estate, the future uses are of more than ordinary significance because they stretch over a longer period. The future uses of land extend indefinitely; of buildings until they are entirely depreciated. A rental contract covers future uses only for a stated period, usually

for one year, seldom for more than five years, except in the case of the very long-term leases, 99 years usually, given on building sites.

The real estate market is somewhat better organized than the labor market. But surely more than half of all real estate transactions in the United States are still arranged directly by the two parties concerned. This is more true of farm real estate than of urban real estate, and more true in country towns than in the larger cities. Real estate does not ordinarily need to be sold at once. Those who wish to buy it can ordinarily take their time and look about a good deal. Buyers and sellers are thus able to come together in a majority of cases without the services of any intermediary.

The typical middleman in the real estate market is commonly called an " agent." The term " broker " is the one preferred by the trade itself. His methods are essentially those of a broker. It is not considered enough merely to bring prospective buyer and the real estate together. The real estate must be "displayed," and the prospect must be persuaded to buy. The agent also acts as intermediary in arranging the terms of the sale. Very often a temporary contract is signed between the purchaser and the agent as representative of the seller. The actual transfer of title is between the owner and the buyer.

The basis of the arrangement between the owner of the real estate and the broker is a contract, written or verbal, empowering the broker to act as agent or broker for the owner. These contracts are as exclusive as it is possible for the brokers to make them. Owners frequently insist upon reserving the right to try to sell the property themselves and not pay the broker's fee. Some owners also list their property with more than one agent. In most cities of any size, the real estate agents are organized into an association, which usually maintains an office with a paid secretary. The members of such an association frequently co-operate to the extent of exchanging listings. If such a member is unable to satisfy a prospective buyer with anything on his own lists, he is thus able to draw upon the listings of other members. In a number of cities, a complete system of " multiple listing " has been developed. This amounts in effect to having every piece of property for sale placed on every agent's lists.

The other principal type of middleman in real estate is the dealer who buys property outright and manages or rents it until

he can sell it to advantage. The volume of sales of one who is a dealer exclusively can seldom be very large because of the high investment involved in real estate and the slow rate of turnover. Their margins, however, are often very high. Dealers are most prevalent in regions where land is cheap. They often do such things as buy large tracts of land in Florida, or around a lake in northern Wisconsin, or on the outskirts of cities, and sell it out in small lots to a large number of small purchasers. As a matter of fact, there are relatively few dealers who are not also agents or brokers; and most agents or brokers also deal in real estate more or less. The difference is largely a matter of degree. Some are mostly brokers; some mostly dealers. A broker-dealer is almost certain to sell out of his holdings first because dealer's margins are larger than broker's fees. He uses his listings to draw upon in case he cannot satisfy a prospect out of his holdings. A too common type of dealer activity engaged in by urban real estate men is the laying out of subdivisions and selling them to prospective home builders. In many cases, they build houses upon these subdivisions in order to sell them. Dealer activities are greatly expanded by such devices as purchasing on contract or option. The contract may require the dealer to pay for the land in full only when he sells it.

No other field of business activity lends itself so well to being carried as a side line as does real estate selling. Probably over half of all the bankers in the United States handle real estate as a side line. Lawyers, contractors, merchants and retired farmers engage in it, if not as agents, then as small dealers. A mailing list recently prepared of all the agencies handling real estate in the state of Minnesota has over two thousand names upon it. The regular members of the trade are making an effort to check this miscellaneous activity in real estate by getting laws passed which require all agents and dealers to take out state licenses.

In cities the handling of rentals is often a more important part of a broker's business than the handling of sales. The renting of apartment houses is often handled entirely by real estate brokers.

Two important side line activities of real estate agencies are writing fire insurance and acting as brokers in arranging real estate mortgages.

Other activities of real estate associations or boards are the appraisal of property for members of the association and also for

prospective buyers and sellers, and the enforcing of codes of professional ethics.

There still remain to mention the activities of real estate agencies in bringing together buyers and sellers from different districts or sections of the country. This takes such forms as selling farm lands in New York state or Virginia to farmers in Illinois or Missouri, selling cut-over land in northern Wisconsin to factory workers in Chicago or Milwaukee, selling lots in Florida to city people over the whole eastern half of the United States. The machinery for arranging such transactions may be a working agreement between local agencies in the two regions, a system of branch offices or local representatives in the regions from which the prospects are obtained or to which they are sent, or a system of agencies spreading over several states all under one management.

The real estate market could be greatly improved by making multiple listing more general, by increasing the volume of business handled by one agency and reducing the fees to a point that would make more persons use the service, and by eliminating from the field all those who depend more upon misrepresentation and deceitful practices than upon honest "merchandising" for their earnings. This would greatly thin the ranks of even the regular agents and dealers.

No general way has been found for shifting to marketing agencies the numerous risks connected with the ownership of land. In a sense, however, a rental system makes it possible for the operators of farms or users of houses to shift most of the risks to the landlord. This is particularly true of the important risk of price fluctuation. A landlord may be looked upon as a middleman who buys at wholesale all the future uses of real estate and then retails this out a year at a time to tenants. If the landlord has in mind the possible rise in the value of the real estate, it is even more proper to think of him as assuming the rôle of a risk-taker. Real estate dealers who buy up tracts of land in advance of probable need for city lots are also risk-takers of a pronounced sort.

IV. MARKETING ORGANIZATION FOR COMMERCIAL PAPER AND SECURITIES

The problem in this section of the chapter is to describe the mechanism for the marketing of commercial and agricultural paper and of stocks and bonds and other securities after they leave the

point of first issue. The local bank, according to this analysis, is looked upon mostly as a *manufacturer* of *credit*. The raw materials of the process are the capital stock of the bank and the funds of depositors. Out of this is created a special kind of credit known as bank credit which the bank sells at retail for the most part in the community in which it operates. If, however, a bank has a surplus of such credit available, it may sell it wholesale on the call loan market in New York City, or by buying blocks of commercial paper from note brokers, or of real estate mortgages from mortgage brokers. Buying commercial paper or mortgages, from the point of view of a bank, is just a way of selling credit. The orders for credit in a community, on the other hand, may be so large at times that the local bank can no longer fill them out of its own production. Consequently it may have to go out upon the market and *buy additional credit* in order to fill its orders. It does this by selling some of its commercial paper, that is, by having it rediscounted. Or it may sell some of its real estate mortgages or bonds. Since banks in the aggregate do a good deal of selling and buying of their credit outside the local market, they perform a function which is somewhat akin to that of the retail merchant. In effect, at least, they increase the supply of loanable funds available in the community, and find outside markets for the surplus lending power of the community. They are also middlemen in the sense that they act as agents or brokers for other financial institutions, such as insurance companies, farm mortgage companies, investment brokers and the like.

The function of the Federal Reserve System must be interpreted principally as assistance to commercial banks in their job of manufacturing bank credit; but to some extent it is also assisting them in the marketing of their commercial and agricultural paper. The Federal Reserve Banks buy such paper from the member banks, and also buy and sell it in the open market.

The Federal Land Banks are essentially manufacturers or converters. Looked at from one point of view, they convert farm mortgages into bonds and sell them upon the securities markets. Looked at from another point of view, and this is the better of the two, they convert bond credit into farm mortgage credit and sell it to the farmers. The Intermediate Credit Banks serve in a similar capacity. Savings banks convert deposit credit into long-time credit and sell it by buying bonds and mortgages with it.

The financial institutions described in Chapter XXV may therefore be looked upon primarily as the manufacturers of various kinds of credit instruments. They sell a large part of these directly to consumers, often in their home communities. But they also depend in large part upon the assistance of various sorts of middleman agencies. It is these agencies which this present chapter proposes to discuss briefly. Let us consider first those which handle short-term instruments.

Commercial and Agricultural Paper.—The first in importance of the agencies assisting the commercial banks in handling short-term paper is the so-called *commercial paper house.* Its place in the system is as an intermediary between the big borrowers and the banks. Manufacturers and wholesalers frequently need larger loans than they can obtain from local banks; or they can get loans at lower rates in the larger cities if they are able to establish proper connections. Banks in the larger centers usually have surplus lending power. Originally the service of bringing these two together was performed by note brokers who undertook to sell the notes of these borrowers if they could, but accepted no responsibility for them in any way. The modern commercial paper houses which developed out of this brokerage business advance the funds to the borrower and assume full responsibility for selling the notes. If they are unable to find a buyer, they have to carry the loans themselves until maturity. They get their earnings principally from the margins between the rates paid by the borrowers and the rates at which they are able to sell to the bankers. The commercial paper houses cannot afford to take doubtful paper because they cannot sell it. They are institutions with established financial standing; and they offer paper for sale in large quantities. They are therefore able to borrow at rather low rates. Since they are usually able to sell the paper about as fast as they receive it, they need very little operating capital. Small country banks with surplus lending power also make use of commercial paper houses at times. The notes handled in this way are written in denominations from $2500 to $10,000 mostly.

A similar type of agency is the *cattle loan company*, which advances funds to raisers or feeders of cattle, principally the latter, and assumes responsibility for selling the paper to banks. They came into existence in the first place because many cattlemen, especially upon the western cattle ranges, needed larger loans than

the local banks could make or cared to make. Eventually they began to compete somewhat with the local banks for smaller loans. Cattle paper is always secured by a chattel mortgage on the live stock. The cattle loan companies are usually located at the packing centers. Some of them have been organized by the officers of the regular commercial banks operating in such markets. The severe drop in prices of live stock in 1921 forced the majority of cattle loan companies into bankruptcy, and caused the banks which had purchased live stock paper from them to lose heavily. Cattle paper is not selling very well at present.

In the United States, a great deal of buying by retailers is financed by credit furnished by the seller in the form of open book accounts. The rates of interest in effect obtained on such loans are rather high. The discounts for cash if reduced to an annual basis commonly amount to 10 per cent interest or over. But such methods require the jobber or manufacturer to have a large amount of working capital. If a business is growing, or in a period of business depression when merchants cannot meet their accounts, they may require more working capital than can be made available readily by the usual devices of finance. To meet the needs of such situations, agencies called *discount companies* have come into existence which advance funds on book accounts, sometimes up to as high as 80 per cent of their book value. The interest rates are high, but usually less than the discounts for cash. Virtually bankrupt companies are sometimes able to raise funds through these discount companies.

The expansion of the automobile industry has brought with it important problems of financing. A stock of automobiles represents a large investment of working capital. The manufacturers shift the burden of carrying these stocks to the dealers wherever possible. The recent increase in installment buying of automobiles has made the problem still more difficult. A type of discount company has developed which advances funds upon the installment notes given by the buyers. These notes are secured by chattel mortgages on the automobile. The dealer guarantees the payment of the notes. The discount companies borrow the funds they need from commercial banks. The advances are never for the full value of the notes, and the discount rate is usually 5 per cent plus whatever rate the installment notes carry. Other types of agencies make loans direct to automobile dealers on the

security of chattel mortgages on the cars in stock and then sell the dealers' notes to bankers.

Securities.—There are many agencies engaged in marketing real estate mortgages. Many real estate agents and bankers act as *mortgage brokers*. Some make mortgage brokerage their whole business. This means that they take mortgages upon property under instructions from some investor, such perhaps as an insurance company, trust company, or a savings bank. Their earnings arise from the margins between the rates received by the investors and the rates paid by the borrowers. In the field of farm real estate, most mortgages are now marketed through *farm mortgage companies*, of which there are now several hundred in the United States. These companies take mortgages upon farms in their own names and then sell them and sign them over to the purchasers. Bankers, real estate agents and lawyers in country towns commonly act as solicitors for these companies. The borrower makes application direct to the company. A special agent of the company usually examines the property before the loan is granted. The earnings of mortgage companies are in the form of commissions usually taken out of the proceeds from the sale of the mortgage. Many mortgage companies now pool their mortgages, place them in trust, and issue bonds against them, which they sell to the investing public. The margins and fees taken by mortgage brokers and farm mortgage companies have tended to be unreasonably high in the past, but competition with the Joint-Stock Land Banks and Federal Land Banks is probably lowering them.

The principal institutions concerned with the marketing of stocks and bonds are the investment banks, the stockbrokers and the stock exchanges. The *investment banks* handle bonds mostly. Their function in the securities market is to act as middlemen between the municipalities, railroads, or industrial and other corporations issuing the bonds, and the investors wherever they may be. They do not buy the bonds which they sell, but they "underwrite" them, that is, agree to buy at a certain price all that cannot be sold to the public before a certain date. This means that the corporation making the bond issue is assured of sale at a certain figure the moment that it can get an investment bank to underwrite its issues. Before underwriting a bond issue, an investment bank can be expected to make a careful analysis

of the enterprise desiring to be financed. This, therefore, is an important department of such an organization. Technical experts are frequently employed for such work. Investment banks sell some of their bonds over the counter, but they turn most of them over to bond salesmen, to bond dealers and to country banks which make bond-selling a side line enterprise. These latter are the final link in the chain between the issuing corporation and the ultimate investor, and like other retailers, receive a larger share of the margin than the wholesalers in the central market. Sometimes bond brokers intervene between the investment banks and the dealers. One investment bank is frequently unable to float a large bond issue. In such a case, an underwriting syndicate is formed. Frequently one bank takes the major responsibility for the issue and sublets a portion of the underwriting and selling to a number of other investment banks.

There are probably over a thousand investment banks in the United States. The larger ones, like J. P. Morgan and Company, and Lee, Higginson and Company, specialize mostly in underwriting, and the smaller ones more in selling. Investment banks also specialize a good deal by types of bonds, whether railroad, industrial, municipal, or public utility bonds.

Investment banks also in the aggregate sell a large volume of shares of stock of enterprises too small to have their stocks listed on the public stock exchanges. A farm implement company in Madison, Wisconsin, wishing to sell stock and enlarge its plant would probably have no outlet for it except through some investment bank near-by—unless it wished to send salesmen out upon the street with it.

In cities and towns too small to support an investment bank, the local commercial banks frequently undertake to float bond and stock issues.

The Stock Exchanges.—Thirteen cities of the United States have organized exchanges where stocks and bonds are sold daily according to rules laid down by the members of the exchange. New York has three such exchanges, the *New York Stock Exchange*, the *New York Curb Market* and the *Consolidated Stock Exchange*. Although these exchanges are all called stock exchanges, a large part of their transactions, at some periods nearly half, are in bonds. The members of these exchanges are mostly stock and bond brokers, large capitalists and investors, and professional traders or specula-

tors. Only "listed" or approved stocks and bonds are sold on these exchanges. The securities of only large and well-known corporations are listed on the New York Stock Exchange. The Consolidated Stock Exchange handles the stocks listed by the New York Stock Exchange, and certain other stocks in addition, principally mining stocks. The Curb Market handles a list of over a thousand securities not listed in the other two exchanges. It therefore provides a market place for the securities of the smaller corporations, and of those not yet well established. Exchanges on the New York Stock Exchange are in lots of one hundred shares or multiples thereof, on the Consolidated Exchange in lots of ten or multiples thereof. The volume of sales in the New York Stock Exchange for the ten years between 1911 and 1920 averaged 167,000,000 shares annually. The Curb Market averages about 60,000,000 shares annually, and the Consolidated Stock Exchange somewhat less than this. On all the twelve exchanges outside of New York combined, only one-sixth as many shares were sold in 1920 as upon the New York Stock Exchange.[1] On days of great activity in the stock market, the volume of sales may reach over two million shares. The volume of bond transactions on the New York Stock Exchange is about half that of the stock transactions.

Persons not members of the exchanges do all their buying and selling through the brokers. The fees are 25 cents a share for shares selling from $100 to $200, and more or less than this according to the price of the shares. The New York Stock Market is a market for more than New York City. The brokerage houses have branches all over the United States all joined together by systems of leased wires. On some days, over half the business originates in the branch offices. There is always a good deal of wiring or telephoning of orders from customers in surrounding territory. This is particularly true in the New York territory. The transactions in the twelve other stock markets are mostly in local securities.

There yet remains to discuss the speculative phases of the activity of the stock exchanges. In actual numbers, the transaction of the professional traders and the speculators bulk larger than those of the investors, although it is sometimes difficult to distinguish between a speculator and a person making a temporary

[1] S. S. Huebner, *The Stock Market*, p. 19.

investment. There is a tremendous volume of transactions just between members of the exchange on their own account. Even the brokers now operate a great deal on their own account. Purchases of shares through brokers are either made outright or *on margin.* In the latter case, the purchaser pays down only a part of the price, usually $10 a share, and the broker carries the rest as a loan to the purchaser, holding the shares as security. If the market falls off $10, the purchaser has to deposit additional margin or the broker will sell the shares to protect his loan. Buying on margin enables a speculator to buy and sell a much larger volume of stock, and hence increase his prospective gains. It is therefore an important feature of speculation. As already pointed out in the case of commodity exchanges, a speculative market is not complete unless it is possible to " sell short " as well as " buy long." The stock market has its " bulls " and " bears " the same as the commodities market. Short-selling orders are executed through brokers the same as other purchases and sales. The margins in this case are to cover possible rises in the prices above the future delivery price.

The Stock Exchanges and Risk-Taking.—There are many who believe that the commodity exchanges render a useful service, but that stock exchanges are without social justification and should be abolished.[1] The commodity exchanges provide facilities for hedging and hence shifting to specialists the risks incident to holding a commodity after it is produced and until it is wanted for consumption. The risks of ownership of stocks and bonds are necessarily assumed by the person owning them. If the stock exchanges have a function relative to risk-taking, it must therefore be of a different sort than that of the commodity exchanges. Let us first look at it from the standpoint of the investor. Our chapter on "Risk as a Factor in Production" included the risks of capitalists as one of the major classifications. Any purchaser of stocks is taking a long chance unless he has thoroughly analyzed the enterprises. Most investors do not have the time or the knowledge and skill required for such an analysis. The price at which any recognized stock is selling on the New York Stock Exchange represents the combined judgment of a large number of specialists armed with all the available information. These prices are therefore the safest available guides to purchasers. The only stocks

[1] Henry Clay, *Economics for the General Reader*, p. 93.

which are safer from the standpoint of the investor than those traded in on the New York Stock Exchange are those of long established enterprises which have largely passed out of the speculative stage and hence are no longer traded in on the exchanges.

The stock exchanges furnish not only the most accurate available index of the prospective earning power of the enterprise at time of purchase, but also of later changes in prospects, so that the investor is kept aware of all important developments.

What is perhaps still more important, the constant trading on the stock market makes it possible for investors to dispose of their stocks and bonds at any time they do not like the prospects, or need to sell for any other reason. In this latter connection, one must remember that commercial banks, savings banks, insurance companies, building and loan associations and other similar institutions invest largely in stocks and bonds, particularly in bonds, for the reason that they can always dispose of them readily if they need more funds. The stock and bond market therefore is of great assistance to all these institutions in reducing their risks.

The stock market assists entrepreneurs in their risk-bearing by holding up the prices of their securities to a somewhere near reasonable level in periods of adversity when the psychology of the ordinary public mind might discount them entirely, and by giving their securities some sort of a market value while their business is still young and not thoroughly tested, and thus at the same time making it possible for them to float additional securities. Finally, if investors lacked their present facilities for disposing of their securities at will, they would demand greater concessions from the entrepreneurs before they would buy them.

There are those who will admit the foregoing, but insist that speculative trading is not necessary, that at least short-selling can be abolished to advantage. The justification of short-selling is, as in the case of commodity speculation, that it makes prices more stable and reduces the extremes of the long upward and downward swings. The inclusion of the short-selling insures a more thorough testing out of the market at every turn. It also increases the number of specialists studying the market and analyzing securities. While the stock exchanges and all of their fundamental features may be socially justifiable, one would hesitate to justify all of the practices associated with them. This textbook, however, is not the place for a discussion of these harmful practices.

The large amounts of credit required for financing the transactions taking place on the New York Stock exchanges are furnished by the New York banks, mostly in the form of call loans. This means that the traders get their money at low rates, but that they must be ready to meet a call at any time. This they can nearly always do, since the stocks and bonds in which they deal are always salable. The two institutions thus fit into each other's needs, the banks making highly liquid loans, and the traders getting cheap money. When the market breaks badly, however, and money becomes scarce, the more reckless traders may be forced to desperate measures, and the whole stock market may be thrown into turmoil.

V. THE COÖRDINATING FUNCTION OF THE MARKETS

We can now take a panoramic view of the four markets which we have been studying, looking at them from the angle of their rôle in coördinating production. The prices of the different products, the wages of labor, the prices of real estate, and the rates of interest, as made in their respective markets, determine in large part at what rate the various elements will flow into the production of different commodities. If prices of a commodity rise, producers of it will call in more labor and capital and expand the production of it. If the prices continue high, entrepreneurs will start new enterprises at a more rapid rate than before. The more static elements that are involved, the longer the time that will be required for the response. Other things being the same, the better organized the market, the quicker will be the response. This is because the prices of the commodities and of the production elements involved will the sooner reach their proper new levels. The large central markets therefore have an important part in the coordination process because they concentrate at one place the price-making influences of a large area. The wholesale prices are the truest indexes which we have of changes in fundamental price influences.

In the commodity markets, the principal weaknesses in the marketing system are found between the central market and the local retail market. All in all, production and consumption of many products manage to get out of line a great deal, and to stay out of line for a long time. One illustration of this will suffice: A large crop of peaches ought to move from the producer to the con-

sumer much more rapidly than a small crop, and at lower cost per unit of product, and sell for much less in the retailer's market. That is what would happen if the producer and consumer lived in the same locality. But what happens instead is that retail prices fall only a little; but this little is nearly all reflected back to the point of production, which makes prices so low there that many of the peaches are not marketed. Forty cents on a bushel of peaches means little in the retail market; it may reduce the price at the orchard from $1.00 to $.60. Our elaborate commodity marketing system therefore comes very far from functioning efficiently as a coördinator. Some way must be found of tightening the marketing chain and taking out the slack between the links.

The labor market coördinates very poorly indeed except locally. Wages of factory labor may vary by 30 per cent between cities a hundred miles apart. In the summer of 1916, wages of farm labor had a range of 50 per cent between the different counties of Wisconsin. Wages continue much higher in our northern than in our southern states. Surely differences in potential efficiency can account for only a small part of this. Only when the same grade of labor is equally well paid in all parts of a country can its labor market be said to be adequately organized.

The greatest need of the land market is some way of grading land so that we can know its true differences in productivity. Until this is done, we cannot really know how poorly its market is organized. But surely the wide differences in income between farmers in various parts of the United States cannot all be explained by differences in size of farms, amount and quality of capital goods used, and in grades of the farmers themselves. Within any city, the price of most land is well enough adjusted to conditions so as to force the land into its proper use; but there are some glaring exceptions to this, which city zoning is trying to handle.

Differences in interest rates in various parts of the United States are partly but not altogether accounted for by differences in risks. The three Federal institutions created since 1913 have done much to equalize credit conditions in various parts of the United States, and will do more in the future. They are facilitating the flow of loanable funds from the East to other parts of the United States. The price at which stocks and bonds sell in the stock exchanges

and the ease with which they sell, is a very important factor in determining which industries are expanded and which are not. Probably a better case can be made for the stock market on the score of its function as coördinator than its function in risk-bearing.

Chapter XXVIII following takes up in more detail the maladjustments growing out of the failure of these markets to coördinate production properly.

SUGGESTIONS FOR FURTHER READING

For a more detailed treatment of certain phases of commodity marketing, the reader is referred to Fred E. Clark's *Principles of Marketing* (1922). This text develops the principles of marketing from a functional point of view. Another general text on the subject is *Marketing* (1925) by Edmund Brown, Jr. Half of this book is given over to a description of commodity marketing and the remainder is devoted to a discussion of the various types of middlemen agencies. A book which restricts its subject matter to the marketing of a line of related products is B. H. Hibbard's *Marketing Agricultural Products* (1921). L. C. Marshall's *Business Administration* (1921), Chapter IV, contains a helpful series of readings on marketing problems. The marketing field is covered in still greater detail by Fred E. Clark's *Readings in Marketing* (1924).

For a general treatment of the labor market, the reader is referred to Don D. Lescohier's *The Labor Market* (1919), Part II. This book also contains an excellent bibliography on the employment of labor. See also *Farm Labor in Wisconsin* by H. C. Taylor and J. D. Black, Bulletin 316, Agricultural Experiment Station, University of Wisconsin, 1920, for a discussion of a particular type of employment problem. Shelby M. Harrison's *Public Employment Offices* (1924), gives much information regarding the recent development of employment offices.

A discussion of certain phases of real estate marketing and functions of middlemen may be found in Philip A. Benson's and Nelson L. North's *Real Estate* (1922), Chapters V, VI, XII and XIII. *Principles of Real Estate Practice* (1924), by E. N. Fisher treats of the functions of the real estate broker. Chapters I, III, V and XI are most closely related to the question of marketing. A description of activities in the marketing cut-over forest land may be found in United States Department of Agriculture Bulletin (1295), *Land Settlement and Colonization in the Great Lake States* (1925), by John D. Black and L. C. Gray.

Additional reading dealing with the marketing of securities and describing the various middlemen in the securities markets may be found in Harold G. Moulton's *Financial Organization of Society* (1925), Chapters XII, XIII, XIV, XV, XX and XXVI; Laurence Chamberlain's *Principles of Bond*

Investment (1911), Chapter XI; William H. Lough's *Business Finance* (1917), Chapters XIV and XV; H. W. Babson's and Ralph May's *Commercial Paper* (1920), Chapters I, VII; W. H. Kniffin, Jr.'s, *Commercial Paper* (1920), pp. 1–14; Ray B. Westerfield's *Banking Principles and Practices* (1924), Chapter XXXI. S. S. Huebner's *Stock Market* (1922) considers in detail the operations of the stock exchange. Charles O. Hardy's *Risk and Risk-Bearing* (1923), Chapters VIII and XI, deals with the security and commodity markets, particularly the highly organized markets.

PROBLEMS

1. How does the principle of decreasing outputs operate with respect to middlemen engaged in the exchange of commodities?
2. As the volume of commodities to be exchanged increases, will there be a tendency for more middlemen to engage in the process of exchange? Explain.
3. Has the principle of specialization any bearing upon your answer to No. 2?
4. If a number of steps in marketing are combined by a single agency, is that any indication that a fewer number of people are engaged in the process?
5. What is meant by assembling?
6. Can any agency be only a buyer or a seller?
7. What is meant by "dispersion" or "distribution" as applied to marketing?
8. Prepare a list of the exchange activities discussed in Section I of this chapter. Indicate which are more closely associated with buying and which with selling.
9. Prepare a list of middlemen mentioned in Section I and indicate *very briefly* the function each performs.
10. What are the principal functions of commodity exchanges?
11. Select a commodity with which you are familiar and draw a chart illustrating its line of distribution from the producer to the consumer.
12. What is the difference between a "commission man" and a "broker"?
13. What are the principal factors determining the size of the marketing unit?
14. What type of commodities or services would you expect to be handled by small marketing units? Why?
15. Will labor markets ever become as specialized as commodity markets? Why?
16. Why is the establishment and maintenance of employment agencies a proper sphere for governmental action?
17. To what extent can there be specialization in the real estate market?
18. Why is it proposed that real estate dealers be licensed by the state?
19. What function does the dealer in commercial paper perform that could not be performed by the commercial bank?

20. What is the difference between a "commercial paper dealer" and an investment banker?
21. What is the function of the investment banker?
22. What is the purpose of the stock exchange? Does it have a place in the marketing of securities?
23. What is meant by the coördinating function of markets? What do they coördinate? How?

CHAPTER XXVII

THE ORGANIZATION OF TRANSPORTATION, STORAGE AND COMMUNICATION

The place of transportation, storage and communication in the scheme of production should be sufficiently patent by this time. Many wants could not be satisfied at all did we not have some ready means of transportating commodities from the place where they are produced or are available. Mines must remain where they are; most people for good and sufficient reasons have to live somewhere else; without transportation they could not have the coal and the iron. Other wants could be satisfied, but only at great sacrifice because of the difficulty of producing where people have come to live. Improved transportation has made it possible for them to be produced under much more advantageous conditions and distributed to those who would like them. All that is necessary is that the cost of transportation shall be fully offset by the reduction in cost from producing them under more favorable conditions. Some of the goods thus transported are the very necessities of life. Improved transportation has therefore lowered the cost of a subsistence living. Other goods that have come to be transported, like tropical fruits, have principally added more variety to our living, or provided an opportunity for the expansion of our wants. We must not forget that the transportation of persons is a part of the picture, and probably an increasingly important part of it. Our wants are probably expanding as rapidly in the matter of travel as along any other line.

Storage likewise makes it possible to satisfy many wants that could otherwise not be satisfied at all. We could not have fruits and vegetables in the winter time in our northern latitudes had we not developed methods of preserving and storing them. Other products we could have at many seasons of the year only at great cost. Storage no doubt reduces the winter cost of butter and eggs. It is cheaper to produce them in the summer and store them than to produce them in the winter. We have a choice between canned tomatoes at a low price and greenhouse tomatoes at a very high

price. We also have a choice between canned tomatoes and southern grown tomatoes. Thus transportation and storage partly substitute for each other. A better example of this is the choice between storing the surplus of large crops waiting for a lean year, and transporting the surpluses of any one region into the deficit regions that same year. Both of these practices have increased greatly the population capacity of the earth. But transportation and storage also go hand in hand. Every car in which goods are transported must be looked upon as a place of storage for the time being. This is particularly evident in the case of goods needing refrigeration or frost protection in transit.

Communication takes such varied forms as the mails, telephone, telegraph, cable, radio and messenger service. Modern communication is a very important feature of modern production. A very large part of the buying and selling of to-day is arranged by mail, telephone, telegraph or cable. These are also absolutely essential to the dissemination of market information. The radio is also being used increasingly in distributing market news. The rôle played by communication in primary production is in furnishing information to be used in planning production and keeping it properly adjusted to consumption. Better communication would help eliminate many of the maladjustments in production discussed in the next chapter. Lastly, a very large part of communication takes the form of direct personal service. This is especially true of the mails, the telephone and the radio.

I. TRANSPORTATION

1. Steps in the Process

The transportation of factory products destined for family use in the United States generally includes the following steps:

(a) Loading on car at a siding built to the factory; in some cases, drayage to a freight station or dock instead.

(b) Transportation by rail or water to some jobbing market, or direct to retailers.

(c) Unloading from car to jobber's warehouse. Sometimes it is possible to arrange to forward carlot shipments to retailers without unloading. Jobbers usually have special railway sidings built to their warehouses; if not, they are located close to freight terminals so that trucking hauls are very short. The smaller the local jobbing

unit, the more delivery that can be made in this way. All the deliveries to retailers in large cities are made in this way.

(d) As each jobbing market is also a consuming center, delivery by truck to retailers in the surrounding area. Jobbers are using motor trucks increasingly for their deliveries to retailers in cities and villages near-by. They are also making deliveries increasingly to crossroad and small village stores.

(e) For more distant points, reloading upon cars for shipment by rail. Trolley freight may be used instead of railways in densely populated areas supplied with such facilities. If the jobbing center is a lakeport or seaport, some of the forwarding may be done by boat. Trucking will be required wherever a warehouse has no railway siding, or ordinarily when shipment is made by water or trolley.

(f) Trucking from the freight station or car to the local retail store. Occasionally deliveries to consumers are made direct from the car.

(g) Delivery at consumers' homes, partly handled by the consumers themselves.

Farm products on their way to domestic consumers make a variety of transportation steps. There is always the collecting and loading on the farm, and the haul by wagon or truck to the local market. This local market may be a grain elevator, in which case the product is " elevated " from the farmers' wagons to the bins in the elevator, to be later spouted into cars and perhaps hauled to terminal elevators, again elevated and later reloaded, perhaps hauled directly to flour mills or feed mills. From the mill on, the transportation is roughly as outlined for other factory products. If it is live stock that is being considered, the cars are loaded at local stockyards and hauled directly to packing plants, or else hauled to central markets and unloaded into pens from which they are sold to the meat packers. Certain classes of live stock especially may be reloaded and forwarded to markets farther east. An increasing amount of live stock is trucked directly from farms to packing plants. If the product is cream, it is delivered at a local creamery, and the butter made from it is hauled by wagon or truck to the nearest freight station and loaded directly into cars. Creameries in the large country towns may have their own railway sidings. The so-called "centralizer" creameries receive their cream by rail or in large truckloads from con-

siderable distances. The ordinary local creamery is too small a unit to have a carload of butter at one shipment. Full carloads may be made up by collecting the product from several creameries along one railway line; or the small lots may be combined at the nearest large junction point of railway lines. Much of such combining is done in the Twin Cities, Duluth and Chicago. Fluid milk for city consumption may be delivered from house to house by the primary producers of it—this is still the practice in small cities and villages;—or delivered by the primary producers to processing plants, from which it is distributed in bottles to consumers, or to retail grocers, or in larger quantities to restaurants and hotels; or delivered by primary producers to shipping stations, whence it is forwarded to city processing plants. Fruit and vegetables for shipment are loaded directly into cars from growers' wagons or trucks, or else put through a sorting and packing shed first. They are shipped in carlots to any consuming centers large enough to use whole carlots; otherwise in carlots to jobbing points to be distributed like other jobbing products. The usual course for locally grown fruits and vegetables is hauling to public markets, trucking to retail stores, and delivering to consumers along with the groceries. Some are taken away by jobbers and shipped or trucked to retailers in their territory. In small cities, the first delivery is usually to retailers.

Mineral products, after being trammed to the shaftway and hoisted to the surface, are moved to their destination in full carlots, usually full train loads. The iron ore of the Upper Great Lakes region is delivered from immense ore docks into ore boats to be conveyed by water to blast furnaces and thence to steel mills at lower Great Lakes ports. From the steel mills, the finished product is shipped by rail or water to fabricating plants principally in the Eastern and North Central states. Most of the copper ore in the United States is smelted near where it is mined, as it is cheaper to haul the coal to the ore than to haul the ore to the coal. Coal, because of its low value per ton, is transported by water whenever possible; but at the best by far the largest part of it has to be hauled part of the way by rail.

The foregoing are only the typical forms of transportation in the great population centers of the western world. In areas of earth surface traversed by them, the camels of the arid regions of Africa and Asia, the packhorses or mules of the mountains or sparsely

settled regions of the earth, the water buffaloes of the tropics, the sledge dogs and reindeers of the Arctics, and last but not least, the human pack and litter carriers of the interior of Africa, of the Orient, and many densely populated portions of Europe, probably still outstrip all the railways and inland waterways combined. They do not ask special ways to be built for them, or if they do, the ways are very simple. Such transportation service, therefore, springs up quickly where it is needed and as quickly shifts to other areas or other work.

For transoceanic transportation, the only facilities required are the ocean vessels and the ports with their equipment for loading and unloading. This equipment may be very elaborate. For example, New York Harbor has 320 miles of frontage developed for the docking and loading and unloading of ships; and yet there is congestion. There must be these same facilities at both ends of an ocean journey for the loading and the unloading. Sometimes the transfer is from a light-draft river steamer to a larger ocean-going vessel, as of wheat at the Canadian port of Montreal.

2. *The Size of the Shipment*

In all transportation, the size of the individual shipment is a matter of first moment. The smallest shipment is a letter or post card. Much merchandise moves to-day as parcel post. The mail service of the United States handles over fifteen billions of postal packets annually; that of the United Kingdom, over five billions annually; that of Japan, nearly four billions annually. Next in size comes the express shipment. Important in freight service is the distinction between the carlot and the less-than-carlot shipments. Ore, fuel, logs, and in some areas live stock, grain, milk, and even fruit and vegetables move in whole trainloads in season. In ocean freight service, the major distinction is between full cargoes and part cargoes. The ocean liners which carry passengers and mail carry in addition a much larger volume of freight in the form of products of the perishable type, and articles of high specific value such as silks, linens and jewelry.

3. *Transportation Routes*

Produce moving between two points tends always to seek the shortest line between them. The term " shortest " must be understood in the economic as well as the physical sense. The shortest

route in the physical sense, the "air line" route, may lead across a mountain range, a swamp, or lake which is frozen part of the year. The railroads going east from Minneapolis find that the "shortest" route in the economic sense is south of Lake Michigan or perhaps north of it via a car ferry across the straits of Mackinac. In a new country, the shortest line in the economic sense may be to follow the course of a meandering river. Ocean traffic is frequently not able to follow a direct line between two ports—jutting peninsulas, islands, reefs, icebergs or fog banks may lie in the way. The heaviest traffic moves between points of sources of raw materials and manufactured products derived from them, and points of concentration of consumers or users of these products. Most trade is reciprocal; a point of origin for one product is also a point of destination for other products. In its search for the shortest route between population centers, traffic becomes concentrated along highways offering easy transportation, such as easy grades, valleys, lakes, large rivers, or around certain points, such as ends of lakes, or capes, and in lines or lanes between these points. These lines or lanes in which traffic becomes concentrated are called *trade or transportation routes*. Since most forms of transportation require some improvement of the way, such as the building of railways, or improvement of harbors, or erection of lighthouses, traffic is in effect actually concentrated within very narrow limits. Thus even in the broad Atlantic Ocean, vessels travel in sight of each other much of the time.

Factors Determining Location.—It follows from the foregoing that the factors determining the location of trade routes are as follows:

(a) *Location of Centers of Population.* Population naturally concentrates most in areas of abundant natural resources. The term natural resources must be understood broadly in this connection, as including not only mineral, timber and soil resources, but also good climate, advantageous location for commerce, such as the British Isles enjoy, good harbors, good connections with the *hinterland* (the technical term commonly used to designate the trade region lying behind a seaport or lakeport or inland city). The type of product affects very greatly the amount of concentration of the population. Coal and iron will support a population of much greater density than will timber or agricultural products.

Actual lines of traffic connect cities; therefore anything which determines the location of cities also determines the exact location of trade routes. For the most part, the location of cities and trade routes are determined by the same causes and at one and the same time. The most important single factor operating in this way is the location of good harbors. A port is the connecting link between its hinterland and the rest of the world. All the inland trade routes converge at ports, where they meet the ocean or lake routes.

We must not get to thinking of trade routes in such a large way as to forget that the same organization of traffic applies in a small way within one area as well as between areas. For example, there is a convergence of traffic over definite trade routes from all directions at the city of Chicago, and again at Dubuque, Iowa, lying upon one of the routes leading to Chicago, and again at any number of small points connecting with Chicago by way of Dubuque. These minor trade routes connect cities, villages and cities, and farms and villages.

(b) *Distance in the Physical Sense.* An engineer laying out a railroad will naturally chart the most direct course he can find between two points, providing it is cheaper to build, maintain and operate such a direct line than one built over a more circuitous route with easy grades or with simple river crossings. Ocean traffic of its own accord seeks out such direct routes. There is also frequently a choice between a direct route between two large population centers and a more indirect one which takes in important secondary population centers on the way. The most direct route between New York and Boston, for example, does not take in Providence and many other important shore points. The most direct route between the Panama Canal and Europe does not pass very close to New York City.

The most direct route between two points is a matter upon which we are frequently greatly deceived because we make our observations from maps rather than from globes. The farther north or south from the equator a route is laid out, the shorter the distance between longitudes. At the equator, one degree of longitude represents about 69 miles, at the latitude of London, about 40 miles. Montreal is thus over 300 miles nearer Liverpool than is New York City. The shortest route between any two points is always along a great circle of the earth connecting the two

points.[1] It is much worth while even for a mature student who has not done it recently to take a string and lay off on a globe the shortest lines between the major ports of the world. He will then see why vessels passing through the Panama Canal en route to Asia, unless desiring to include the Hawaiian Islands in their route, hug the western coast of North America clear to the Alaskan Peninsula, and why Japan is upon a direct line of traffic between the United States and the Philippines.

(c) *Water Courses* affect the location of trade routes in several ways. If they are navigable, like the Great Lakes of the United States, and the St. Lawrence River below Montreal, they draw a great volume of traffic to them and determine the location of cities and railroads leading to them. If they are navigable only part of the year, however, railroads will have to be built paralleling them, and traffic will then be divided between them in the open season. If they flow in the direction which most of the traffic needs to move, as does the St. Lawrence, they will be used more than if they flow crosswise of this direction, as does the Mississippi River. The much lower cost of water transportation per ton-mile may, however, offset the advantages of a shorter land route. The railroads of the United States use over three times as much fuel and labor per ton-mile as do the freighters on our Great Lakes. The cost of hauling a bushel of wheat by rail from Lancaster, Pennsylvania, to Philadelphia, a distance of 68 miles, is 11.5 cents; from New York to Liverpool by water, a distance of nearly four thousand miles, is only 7 cents.[2] Most of the traffic of southeastern Europe takes the long water trip through the Mediterranean and up the west coast of Europe, in preference to a much shorter overland route.

If the water courses are only partly navigable as is the Mississippi and the St. Lawrence above Montreal, making transshipment from smaller to larger vessels and back necessary, then they will draw much less traffic to them.

When inland watercourses flow directly into ocean harbors, as is frequently the case, they are more likely to be used.

(d) *Topography.* Mountains are the principal physical relief

[1] A great circle is defined as a circle dividing the surface of the earth into two equal parts. An infinite number of great circles can be drawn through any point on the earth, but only one connecting this point with another.

[2] *Yearbook, U. S. Department of Agriculture*, 1924, pp. 1158 and 1163.

feature affecting the location of trade routes. The railways connecting the Mississippi and Ohio Valleys with the Atlantic seaboard all pass through gaps in the Allegheny Mountains. The Chesapeake and Ohio Railroad breaks through the mountains in the James River Valley; the Baltimore and Ohio Railroad in the Potomac River Valley; the Pennsylvania Railroad at Pittsburgh at the junction of the Allegheny and Monongohela Rivers

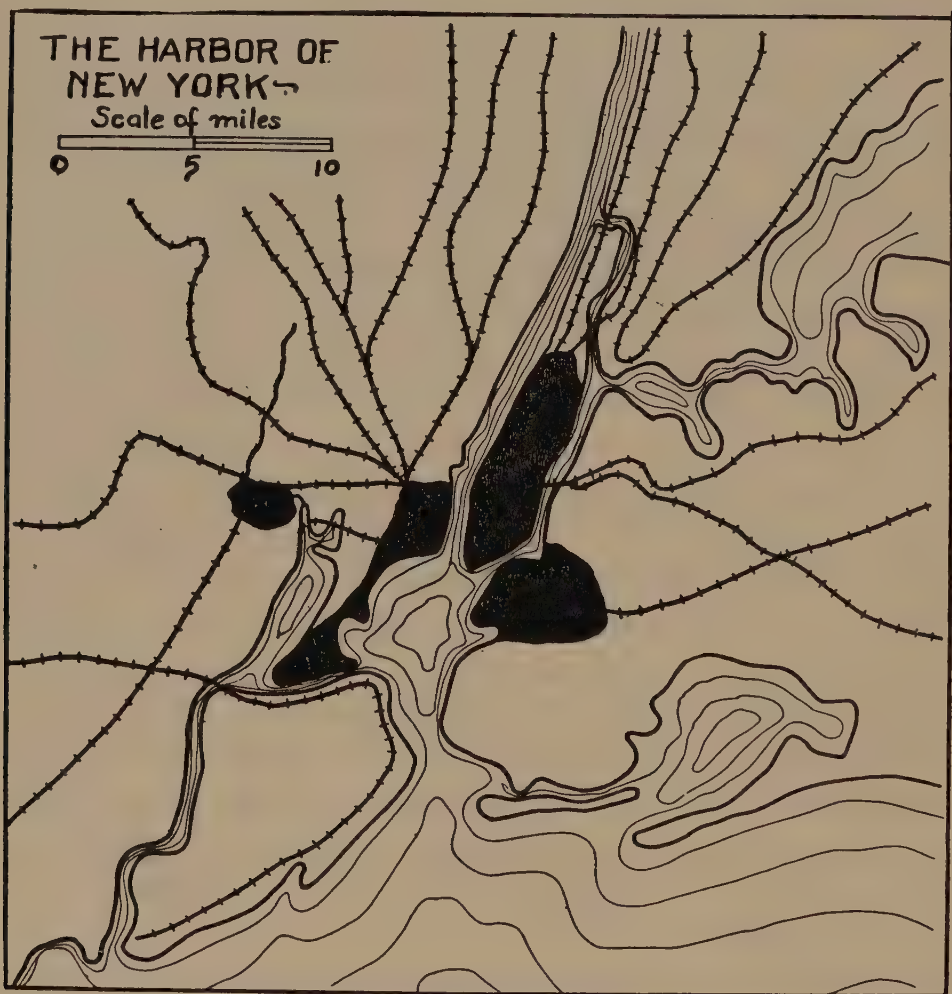


FIG. LXIV. New York Harbor, with Accompanying Railroad Connections.

with the Ohio; and the New York Central follows the same route as the Erie Canal. The Rocky Mountains have an even more pronounced effect. The Southern Pacific route has the lowest grades; the Denver and Salt Lake Railroad, with a maximum elevation of 13,000 feet, has the steepest grades. Even in a region with as mild relief as Wisconsin, topography becomes an important factor. Some of the railroads have purposely sought out the smooth central sandy plain for their courses. A railroad line

crossing this plain in a north and south direction has to negotiate a cuesta of several hundred feet in eight or ten miles or else do some very heavy grading. Wagon roads are laid out on section lines in prairie regions, but have to follow local contours elsewhere. Some of the roads in such regions keep to ridges, and some to the valleys. In such cases, the connecting roads are often very steep.

(e) *Harbors.* Ports are the connecting link between inland and water transportation routes. The very existence of a good harbor determines to some extent the amount of international trade that will develop between countries across the sea from each other. In the second place, the location of good harbors determines where the inland trade routes as well as the ocean routes will converge. The requirements of a good natural harbor are (a) an abundance of anchorage room and frontage for docks and quays, (b) depth of water, (c) protection from storms by encircling land, (d) a safe entrance, (e) freedom from ice, and (f) easy grades for rail connections with the hinterland. Water connections are also of value. Some poor natural harbors have been converted into good harbors by the expenditure of huge sums of money for dredging. The harbors of New York and San Francisco, with accompanying railroad connections, are shown in outline in Figures LXIV and LXV.

Factors Determining Importance.—The economic importance of a trade route depends first of all upon the size of the population groups served by it. The great traffic movements of the world are the east-and-west movements between the swarming populations of the North Temperate zones. It further depends upon the amount and types of raw materials and manufactured goods available for shipment at the ends of the route and along its course. The Great Lakes route is important because of the iron ore and grain at one end, and the coal at the other end. The North Atlantic route connecting North America with Europe is important because of the large supplies of food, fiber, metals and the like available at our end and of manufactured products at the European end.

The stage of development of the peoples served by the route is also an important factor. A route connecting a thoroughly industrialized, old continent with a new one will carry much more traffic than a route connecting two similarly developed regions, for the reason that there will be greater difference in comparative

advantage between such regions. One will specialize in producing raw materials and crude manufactured goods and the other in handmade and highly refined manufactured goods. On the other hand, an old country with a dense population and low standard of living, like China or India, will furnish relatively little commerce.

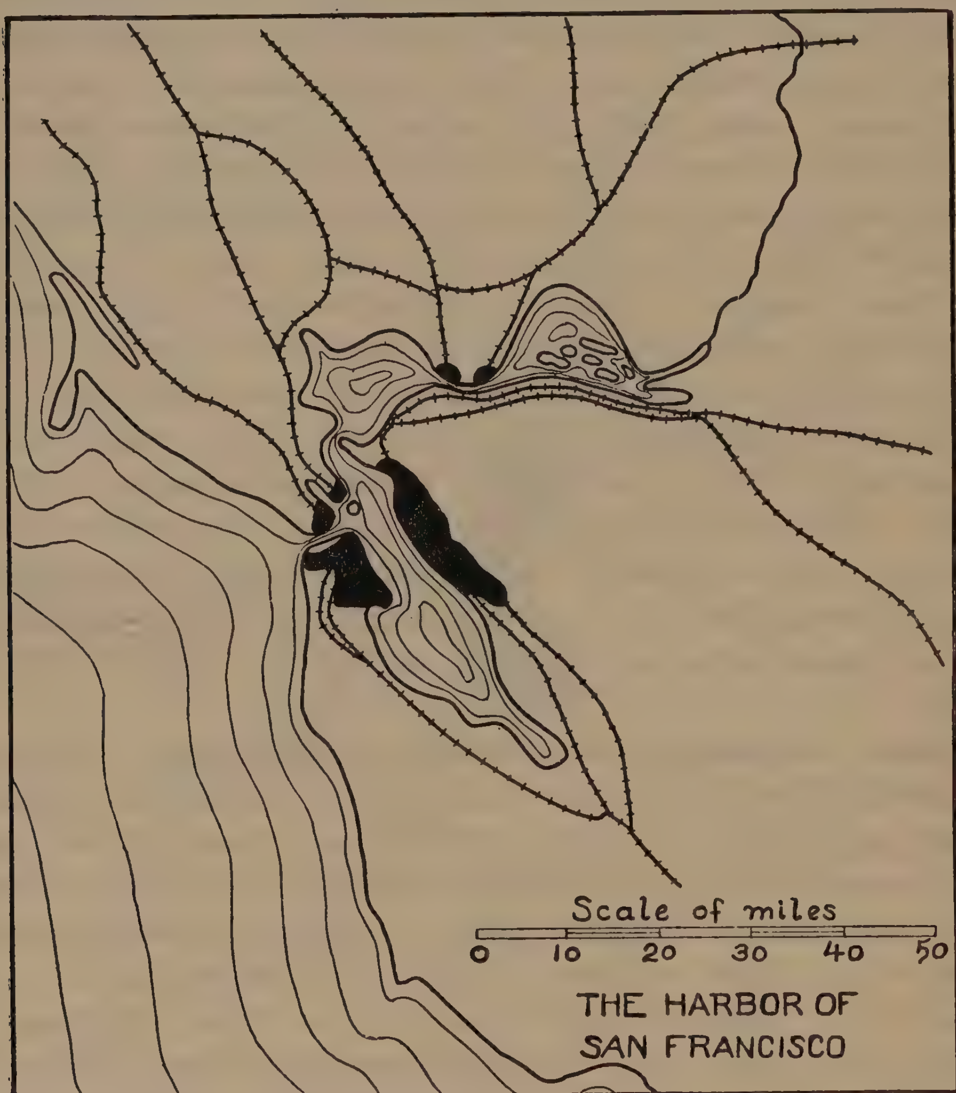


FIG. LXV. San Francisco Harbor, with Accompanying Railroad Connections.

Its people will be largely agricultural, and will live mostly on the food which they grow with their own hands. Its manufactures will be carried on mostly in small shops, and will be largely for domestic consumption. We do not always realize how new after all is the world in which we live. The western hemisphere has been known to civilized peoples for only about four hundred years, and large tracts of it are still largely undeveloped. Even Africa

is still largely wild. The result is that we have peoples in all stages of development trading with each other. The order of development of the earth has been generally from the East to the West. This is further reason for the great east-and-west movement of traffic.

It is frequently stated that in due time when the earth is uniformly developed and civilization is in a more or less static state, the main movement of traffic will be north and south, between the tropics and the temperate and arctic zones on either side. It is even predicted that there will be considerable back-and-forth traffic in seasonal products between the alternate summers and winters of the northern and southern hemispheres. Such a forecast must be looked upon only from a long-time point of view. It may eventually prove to be true. Already there is a large north-and-south movement of foodstuffs between the East Indies, Africa, and northern Europe, and between South and North America.

Important Interior Trade Routes.—The development of a continent depends upon the possibility of establishing routes of trade and travel from one point within it to another. These routes in the first instance are nature's handiwork. The peoples or settlements lying along these routes or at their termini quickly outstrip neighboring localities situated away from the lines of traffic. Once the routes have been established, the growth of the settlements increases the importance of the routes and in turn the routes contribute to the continued growth of the settlements. Under the impetus of such a start, other cities or sections of the country are left behind. These original trade routes thus tend to continue in importance from century to century even though areas of production may shift somewhat. In a continent as highly developed as Europe, the old paths of traffic still retain their predominance although these countries have been covered with a network of railroads. The old main routes carry the through traffic; the crosslines are nothing more than feeders for the main routes; and while they apparently obscure these routes on the railway map, in reality they are continually adding to their importance.

Internal Trade Routes of North America.—The first westward movement of settlement through the Appalachian Mountains followed the Ohio Valley down into the Mississippi Valley, the rivers being the main source of transportation; and through the Mohawk gap in what is now New York state to the Great Lakes.

Once the lakes were reached, settlement extended along their southern shores. The lakes themselves became trading thoroughfares carrying settlers and traders West and bringing back furs to the East. A little later, grain was brought East by the same route. The Great Lakes route opened the whole American continent to the New York district, and as New York was also the terminus of much of the European traffic, it developed quickly as a trading center. This route also had the advantage of a more level course and of lower altitude than the routes through the mountains farther South. Access to the Great Lakes also opened a much larger hinterland than the southern routes to the Ohio River. A little later the opening of the Erie Canal gave this route additional advantage and the routes terminating at Philadelphia and Baltimore were rapidly outdistanced. When the railroads came, the low level terrain of the northern route continued its advantage over the routes passing over the mountains, with the result that the New York-Great Lakes route still maintains its supremacy. Figure LXVI shows clearly how this route reaches into the very heart of the continent.

Mr. J. Russell Smith compares the Great Lakes route to a cable with its strands fraying out in many directions in the West, converging at the important Lake cities of Chicago, Duluth, Toledo, etc., and diverging from the eastern lake ports to the various seaboard points. The Pennsylvania and Baltimore and Ohio railroads connect the eastern lake ports with the lower Atlantic ports, the Pennsylvania crossing the Alleghenies at Pittsburgh, and the Baltimore and Ohio by way of the Cumberland gap and the Potomac River Valley. The eastern outlets from these railroads are Philadelphia and Baltimore respectively, but both have New York terminals. Because of its New York outlet, the Pennsylvania system is probably as important a carrier as the New York Central. The Pennsylvania also draws an immense traffic from its direct line to St. Louis. The other principal route to the East is the Chesapeake and Ohio, which crosses the mountains through the James River Valley and extends to Newport News. There are no important routes from the West to the eastern coast south of Newport News. The other principal east-and-west route is in Canada by way of the Great Lakes and the St. Lawrence River to Montreal, or by way of the Canadian Pacific or Grand Trunk Railroads.

From the Great Lakes westward, there are three principal trade routes, the Northern, Central and Southern. The northern route to the Pacific Northwest is followed by five railroads, the

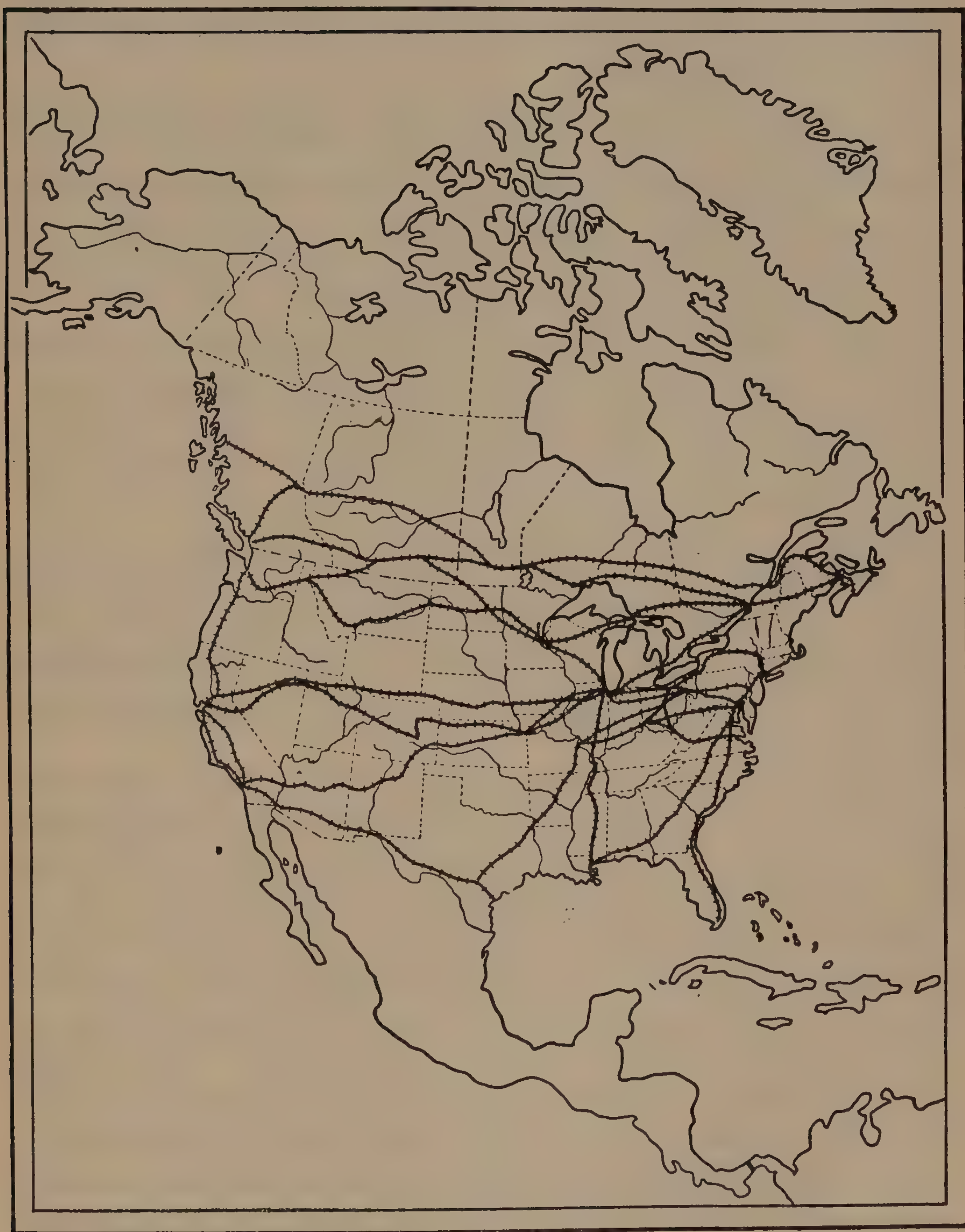


FIG. LXVI. The Important Trade Routes of North America.

Great Northern, the Northern Pacific, the Chicago, Milwaukee and St. Paul, the Canadian Pacific and the Canadian National. The Union Pacific and the Western Pacific follow the central

route, and the Southern Pacific and the Santa Fe the southern route. Each has certain peculiar advantages. The northern route crosses the mountains at their narrowest point. The central roads have steep grades, but the route is shorter. The southern route is the nearest level of all, but it passes through a long stretch of arid and semiarid country.

The principal north-and-south routes are the railroads along each coast, and the Illinois Central from Chicago to New Orleans. The Mississippi River is a natural southern route which, like other American waterways, generally has not been able to compete with railroad competition. Other Gulf cities are the terminals of smaller roads tapping agricultural districts immediately in the rear.

Another route which may become of importance is that from the Canadian wheat fields to Hudson Bay. A projected railroad may be completed before long. This route to Europe is several hundred miles shorter than that by way of Montreal, but ice will keep it closed for the greater part of the year.

The routes east of the Mississippi River for the most part carry manufactured goods and imports westward, and raw materials and food products eastward. The principal raw materials are iron ore, wheat, flour, live stock and live stock products. The lines running from the South northeastward carry cotton for the eastern mills and for export.

The routes to the Pacific coast carry manufactured goods westward for use on the coast and for export, and fruits, grain, lumber, fish and imports from the Orient eastward. They also carry the traffic of points far inland shipped by way of the Panama Canal.

Interior Trade Routes of Europe.—The peculiar shore line of Europe has an important effect upon its trade routes. The many bays and seas extending far inland make almost every point of Europe easily accessible to water transportation. The rivers of Northern Europe flow in the direction of the traffic movement rather than across it, as does the Mississippi in North America. Consequently the rivers are highly improved and are connected by networks of canals. The Danube in southeastern Europe flows through a great surplus grain-producing area into the great southern traffic lane. It is cheaper to transport the bulky grain and other products of the Danube Valley to North Sea ports by way of the Black Sea and the Mediterranean than by way of the short rail haul north to the centers of population. In general the traffic

is divided between the coastwise and cross-country routes on the basis of bulk and the need for quick delivery.

The continent of Europe is netted with railways. London and Paris are the great centers, and traffic lines extend from them in all directions. One main route extends from Paris southwest to Lisbon and another to Rome and Naples. A third route connecting with London passes up the Rhine Valley and thence to Milan and along the east shore of Italy to Brindisi. Mail bound for the Orient is shipped overland to Brindisi where it is picked up by a steamer which had sailed several days before the mail left London.

The Orient Express leaves London and Paris by separate branches which converge at Vienna. The London branch passes through Antwerp, Cologne and Frankfort. The Paris branch runs in a more easterly direction through Nancy and Munich. From Vienna, the Express passes through Budapest, Bucharest and terminates in the Black Sea. Another line from Paris runs parallel to the Orient Express to Constantinople, with a branch to Salonika and Athens. The most important east-and-west line is the Paris-Warsaw Express passing through Berlin and branching at Warsaw to Leningrad and to Moscow. Other important routes in eastern Europe are the railway connecting Leningrad with Baku on the Caspian Sea, and the line connecting Baku and Batum on the Black Sea. The latter opens the Caspian traffic to the Black Sea-Mediterranean route. The Volga River flows into the Caspian Sea from the north and draws a large volume of agricultural products into this traffic lane. Railroads running east from the Caspian connect with caravan routes in Turkestan and central Asia. This road is the first link in the Trans-Caspian railway. It continues east from Krasnovodsk on the east shore of the Caspian Sea as far as Andijan in Turkestan. A branch to the North connects at Tashkend with a line from central European Russia. Another branch to the South terminates at Kushk. Eventually this line will be connected with the railways from India and with the Trans-Siberian railway to the northeast and may indeed be continued through central China to meet the line which is being extended westward from Tientsin.

Interior Trade Routes of Asia.—The principal inland trade route of Asia is the Trans-Siberian railway which connects Leningrad with Vladivostok on the North Pacific coast. Many rivers cross this railroad at right angles and serve as feeders from both North

and South. Caravan routes also connect with this line from the South and bring to it much of the produce of central Asia. Lake Baikal is the dividing point between traffic westward to Europe and eastward to the Pacific. Agricultural products, timber products and furs constitute the bulk of the traffic carried on this railway.

The traffic lanes of China are principally the rivers, many of which are navigable for long distances. Great ocean ports have become established at the mouths of these rivers, Shanghai at the mouth of the Yangtse-Kiang, Canton and Hongkong at the mouth of the Chu Kiang and the Si Kiang. Tientsin in North China is the important city of the Hoang Ho Valley, but this river is not navigable to any great extent. Canals and railroads help to maintain Tientsin's importance.

A thin network of railroads near the coast constitutes China's sole railroad development. Trade still depends on river traffic, and above the limits of navigation, the caravans furnish the means of transportation. A number of caravan routes cross central Asia to the West and meet the railroads extending east from the Caspian Sea and southeastward from European Russia. To the North, these caravans meet the Trans-Siberian railway, and to the South they connect with the railways of India. As the railways are extended, the caravans withdraw, for they cannot compete with the rail transportation. They will probably always be of some significance in Asian traffic as feeders to the railroad lines which will eventually cross central Asia.

Southern Asia's traffic is carried principally in an east-and-west direction, for the central chain of mountains form an almost insurmountable barrier to trade from the North, except at one or two places where the caravan trade from Thibet gets through. India is fairly well supplied with railroad facilities, six or seven lines extending across the country, and a single line skirting the shore south from Calcutta to Madras. The Ganges, Brahmaputra and Indus rivers furnish traffic routes of importance.

Southwestern Asian traffic is still carried principally by caravan, although railroads are being extended southeastward from Constantinople and northwestward from India. Eventually this line, known as the Bagdad railroad, will complete the rail connections between European centers of population and India. This road will carry much of the products of this area to the coast. The caravans which are now the only means of transport in Persia and

in the Near East will then become principally feeders for this railroad.

Arabian transportation lines are principally caravans. These extend from Muskat to Jiddah, from Aden to the head of the Persian Gulf, and to the northwest to Suez, Damascus and other points.

Interior Trade Routes of South America.—South America has few well developed trade routes. The Andes and the Amazon jungles serve as effective barriers to transcontinental routes. Consequently there is but little communication by land between the different sections of the continent. In the North the Magdalena River is the principal trade route of Columbia, as is the Orinoco in Venezuela. These routes carry coffee, gold, hides and tropical products to the ocean. The Amazon, which is navigable for great distances, carries rubber, cocoa and similar products down to Para. A few railways extend finger-like into the interior a few hundred miles from Rio de Janeiro and Santos, and one extends along the coast to Buenos Aires. Buenos Aires is the center of the most extensive network of railroads in the continent, one line even extending to the west coast at Valparaiso. These roads carry the great Argentinian agricultural exports to Buenos Aires. The Parana River flows south from Buenos Aires into Paraguay and is navigable for a long distance. The traffic lines of the west coast consist of short railroad lines extending from the mountains to the coast, and one railroad extending almost the full length of Chile.

Interior Trade Routes of Africa.—Africa is a continent with an elevated central plateau. There are a number of large rivers, but falls and rapids interrupt their navigation. Many of them are navigable above the rapids for long distances. The desert in the northern part, and the tropical jungle of central Africa, separate the two ends of the continent. The Cape-to-Cairo railway is the continent's most ambitious transportation project. A railway from Cairo connects with the navigable upper Nile. From the Cape the road has been pushed northward to the lakes of central Africa, which are now part of the system. The railroad is tapped at intervals by roads leading to the coast, and much of the freight is drawn off in this direction.

South Africa has a network of railways, but the lines need to be extended into the semiarid western country and into the tropical

North. Along the west coast of Africa are a number of small railroads extending into the interior which bring down quantities of ivory, rubber, nuts, oils and other tropical products. The navigable streams supplement the railroads. The two together have largely destroyed the old caravan routes across the Sahara to Mediterranean points. At one time, huge caravans of 10,000 to 15,000 camels carried tropical products north and brought back goods desired by the natives. The caravans still make the trips, but they are becoming smaller and smaller and will in due time serve only as feeders for railway lines.

Interior Trade Routes of Australia.—Australia is largely a desert country with a habitable fringe of coast line on the east, southeast, southwest, and a single point on the north. The southeast section is the most highly developed. A number of railroads have been built through this region, one road extending along the east coast well to the north. A road has been built entirely across the continent from Sydney to Perth. From Perth, extensions have been built both north and south. The principal products of Australia are wool, wheat, meat and minerals. The Darling River extending northeastward through the southeastern territory is the only navigable river of importance. It taps the great interior live stock section of the country.

4. Forms of Transportation

The Caravan.—Oldest of all forms of traffic, surpassing all other forms in romance—when viewed from the outside and at long range—is the caravan traffic of the great desert and waste places of Asia and Africa and of the tropical forest regions. The preceding section has described some of the great caravan routes of Asia and Africa. No less than seven camel routes cross the Sahara desert north and south. Three great camel routes stretch westward from China through Mongolia and Thibet. North-and-south branches feed into these main routes. Persia and Arabia have a network of caravan routes. In the more mountainous regions, horses and mules take the place of camels; in the Arctic regions, sledges drawn by horses, dogs, or reindeer; in the great semihumid or semiarid plains, wagons or carts drawn by oxen or horses. Parts of southern Africa not yet supplied with railroads still depend upon the ox cart for much of their transportation; in the whole of west central Africa, from the Sahara to Angola and

Rhodesia, all traffic away from the rivers and the few short railway lines built in from the coast is over human caravan trails.

As long as any region has to depend upon caravan transportation, its development will not proceed very far. Only articles of high specific value such as tea, spices, silks, rugs and the like, or articles highly necessary for human life, such as food and clothing, will stand such transportation; and the people who depend upon such transportation for a market must either have a very low standard of living, or very inexpensive production.

Obviously also the day of the caravan is passing. As already explained, the building of the Trans-Siberian railway connecting Leningrad with Vladivostok and Peking on the Pacific has already reduced the caravan routes of central Asia largely to mere feeders for the railroad. The Trans-Caspian railroad is having a similar effect in Persia, and the Bagdad railroad when completed will encroach still more on caravan traffic. Railroads are reaching out into the Sahara, and will presently cross it. In the meantime, motor truck caravans are negotiating desert trails more and more successfully.

The caravan played its part in early American history. Back from the coast and away from the rivers, in the days before the settlers had found time to build wagon roads, whatever traffic there was was carried by packhorses. Over certain routes, packhorse traffic grew to caravan dimensions. As the settlers worked westward, they took the packhorse and the caravan with them. The packhorse was usually succeeded by the ox cart. In the prairie region, the ox cart prevailed from the beginning. In 1858, a train of 600 ox carts carried furs from Pembina in the Red River Valley to St. Paul. Wheat was sometimes hauled over a hundred miles to market by ox teams.

Highway Transportation.—Everywhere except in desert or mountainous regions, the packhorse trails were eventually widened into wagon roads over which people traveled in stagecoaches and hauled their produce and supplies in wagons and sleds. These roads were usually constructed and maintained by localities, and few of them were adequate for the needs of long-distance traffic. About the time of the Revolution, the stagecoach trip from New York to Boston took six or seven days. About 1790, the American people got the turnpike idea. These turnpikes were simply improved roads, built first by private capital which took its returns

in the form of tolls collected at gates stationed every few miles. The first turnpike company was chartered in 1790 and completed its highway from Philadelphia to Lancaster in 1794. This road was enough of a success so that many other companies were soon chartered. Pennsylvania at one period had 2380 miles of turnpike road constructed at a cost of $8,500,000, and owned by 102 separate companies. Presently public funds began to be used to build such highways. People began to see that the public was greatly benefited by free and easy transportation, and good roads could properly be supported out of the public treasury. The first federal road was the famous Cumberland road or National Pike, started in 1806, and continued as far west as Vandalia, Illinois, by 1838. Secretary Gallatin had a plan to build a system of federal turnpikes reaching from Washington to New Orleans, to the Ohio River Valley, and up and down the Atlantic coast, at a total cost of twenty million dollars.

Two things happened at this point in the United States to put an end to the epoch of road-building, namely, the completion of the Erie Canal in 1825 and its phenomenal success, ushering in an era of frenzied canal building; and the success of the Baltimore and Ohio and other early railroads in 1830 and following. Meanwhile, the development of the river steamboat beginning with Fulton's invention in 1807, had made the national waterways of the country much more useful. All eyes were now turned from turnpikes to canals, rivers and railroads. The old turnpikes were continued, but few new companies were chartered. Roads again became a problem for local governments. Cities could be expected to look after their own streets pretty well, but not the country roads. In most parts of the United States, city people could not help to build country roads if they wanted to, because they were set off from the country in separate governmental units. Yet the city people wanted good country roads in order to attract business to their stores, and to make their own trips into the country districts less irksome. Besides, in many places a considerable volume of intercity traffic developed. This system of road construction and maintenance persisted generally until 1900 and after. Roads improved as farming districts became more prosperous, but very slowly. The result is that we have had in the United States, until recently, an out-of-date road system and mostly poor roads. Most of the countries of Europe had improved

their roads before the railroad-building era began, and they have kept them in good condition ever since.

In 1905, Frank Andrews of the Bureau of Statistics of the U. S. Department of Agriculture sent out an inquiry to 2800 county correspondents of the Bureau as to the cost of hauling farm products from the farm to the local shipping point.[1] For twelve principal products, the average cost reported was 9 cents per 100 pounds, or 5.2 per cent of the local market value of the product. These figures are for an average-sized load hauled an average distance. The range was from 7 cents per hundredweight for corn, oats and barley to 44 cents for wool; from 1.2 per cent of the value of the tobacco, to 9.6 per cent of the value of the corn. The length of the haul was the largest factor in these variations. The corn was hauled an average of 7 miles; the wool an average of 40 miles. These data are only estimates, and probably the cost figures are all too high, since they are based on hired labor rates, whereas farmers do most of their hauling themselves at slack seasons of the year. On the other hand, they do not include any charge for the use of the roads. Perhaps we can assume that these two contrary effects offset each other. Probably the cost of getting farm produce from the farm to the local shipping point was in those days about equal to the freight on it the rest of the way.[2]

The foregoing gives us a picture of our highway system before automobiles and trucks came into general use. These, with the subsequent development of commercial motor transportation service, have given an entirely new face to the rural highway problem. We have waked up in the past ten years to find our old ideas as to country roads completely outworn. Modern highway traffic on all main routes is now predominantly intercity and cross-country. This means that the unit of taxation for support of highways must be larger than a township. It even needs to be larger than a state. Arizona, for example, can hardly be expected to build highways to be used mostly by tourists traveling to and from California. A large city near a state line is not likely to have adequate approaches from that direction. Some of this traffic is strictly commercial—that is, it uses the public highways in exactly

[1] Bulletin No. 49.

[2] The Commission of Agricultural Inquiry estimated that freight in 1914 averaged 6.05 per cent of the value of *all* goods transported. Prices and freight rates were closely parallel from 1905 to 1914. Agricultural products average somewhere about midway between the extreme high and low values per ton.

the same way that a railway uses its rails and roadbed; but it does not have to own and maintain its roadbed. Hence a new system must be developed for assessing costs of construction and upkeep against different classes of users. New types of road construction have become necessary. Even a well graveled road is ground out so rapidly if the traffic is heavy that it becomes very expensive to maintain. Moreover, poor roads are very uneconomical in other ways. The additional gasoline and tires used up, and the extra wear and tear on the vehicle, more than equal the extra cost of the good road—not to say anything about the extra discomfort and hazard of traveling on a narrow, bumpy, dusty highway.

The first step in the solution of the modern road problem was the adoption of plans for state and federal aid and control of road building and maintenance. The first state-aid highway law was passed by New Jersey in 1891. Within ten years, most of the eastern states had followed suit, and by 1910 a score or more of states west and south. No federal aid was provided for roads after 1838, the year of the last grant to the National Pike, until 1893, when the small sum of $10,000 was voted to establish a small public roads office in the U. S. Department of Agriculture. In 1916 was passed the Federal Aid Road Act authorizing the Secretary of Agriculture to advance funds for the improvement of public roads up to 50 per cent of the cost of improvement. The act at present permits the government's share to increase to as high as 87 per cent of the cost in sparsely settled states like Nevada, but limits the appropriation of the federal government to $15,000 per mile, not including bridges more than 20 feet long. The appropriations under these acts have increased from $5,000,000 in 1917 to $75,000,000 in 1925. To November, 1924, the federal government had assisted in the building of 35,000 miles of improved roads, classified as in Table XXXVI following, at an average cost of $16,900 per mile. As a necessary condition to such aid, the state must establish and maintain a highway department. A second act in 1921 required each state also to provide a system of road maintenance. The worst of all faults in the attitude of the public toward roads is their failure to appreciate the importance of patrol and upkeep. This second act also authorized the Secretary of Agriculture, in coöperation with the states, to designate a system of interstate and intercounty highways, limited to 7 per cent of the mileage of each state. A total of 172,000 miles of interstate roads have been

laid out in this manner. These roads include nearly all cities of 5000 and over, and come within 10 miles of 90 per cent of the population of the United States. Another 251,000 miles has been designated as "state road." There still remains 2,490,000 miles of county and local road. Much of this mileage, however, is of crossroads each serving only a few farmers.

TABLE XXXVI. MILEAGE AND AVERAGE COST OF ROADS CONSTRUCTED WITH FEDERAL AID TO NOVEMBER 30, 1924

Types of construction	*Miles constructed*	*Average cost per mile*
Brick	566	$44,700
Portland cement concrete	6,298	38,300
Bituminous concrete	1,007	33,500
Bituminous macadam	1,774	29,100
Water-bound macadam	893	17,500
Gravel	14,280	9,900
Graded and drained	7,229	7,800
Sand-clay	3,922	7,400

The type of road which is most economical depends upon many circumstances. First of these is density of traffic. An investment of $30,000 per mile represents a high interest cost per ton-mile of traffic unless the traffic is very heavy. Only interstate and important intercounty roads have traffic enough to warrant brick, concrete, or bituminous macadam roads. The Bureau of Public Roads speaks approvingly of the distribution of types of roads in the state of Connecticut as indicated in Figure LXVII. The range in density of traffic of these different roads is very wide. Nearly all of the motor-truck tonnage of the public road system of Connecticut is carried on one-fifth of the mileage, and nearly two-fifths of the passenger car traffic is on less than one-fifth of the mileage. Density of traffic has the further effect on the type of road surface, that the cheaper types of road surface break down under too continuous traffic. Sand-clay roads will not stand traffic of over 500 automobiles per day, and gravel roads will stand very little more. The principal reason for this is probably that the road patrolling required for such roads is unable to keep up with the heavy traffic of rush periods. The ruts started on a gravel road on a busy Sunday morning are worn so deeply even by night that no amount of dragging will bring them back to their former condition. The cost of patrolling and repairing sand-clay and gravel roads is so

great that the present tendency is to build less of them and more hard-surface roads.

Type of traffic is an even more important factor than density of traffic. Sand-clay and gravel-surfaced roads will not withstand motor-truck and motor-bus traffic. All regular motor-truck and motor-bus routes will eventually have to be hard-surfaced. We shall have to come to look at a concrete or brick roadway as almost

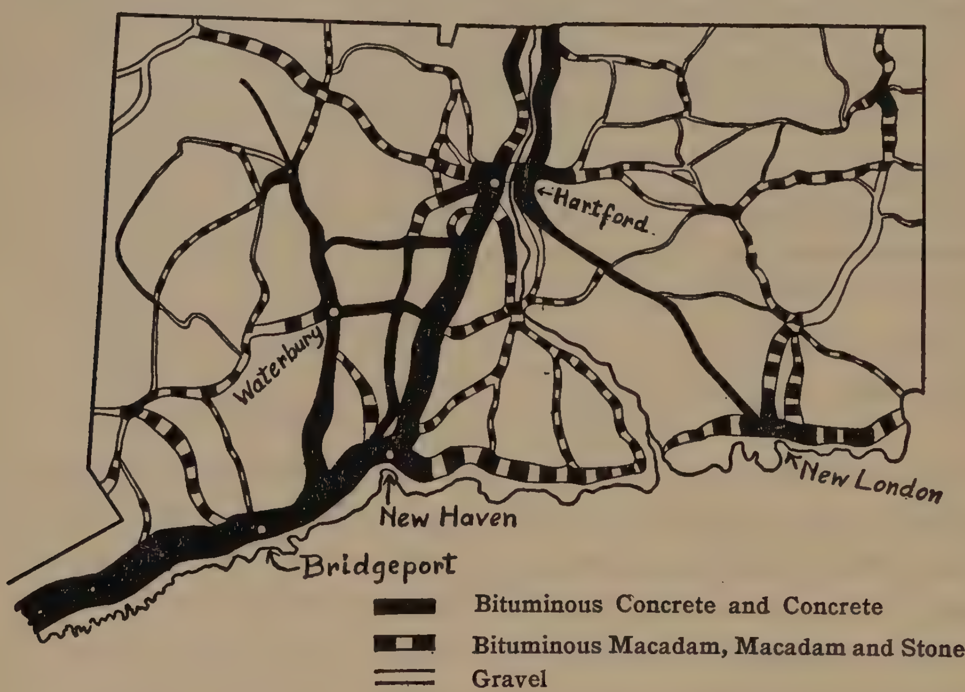


FIG. LXVII. Average Daily Traffic on Connecticut Highway Systems—Passenger Cars and Motor Trucks.

(From Fig. 41 of an article on "Highways and Highway Transportation" in the 1924 *Yearbook of the U. S. Department of Agriculture.* Used by courtesy of the Bureau of Public Roads.)

as necessary to motor transportation as a " railroad " is for railway transportation.

How change in type of traffic has affected the type of road surface is well illustrated by the case of crushed-stone or water-bound macadam roads. The steel wheels of horse-drawn vehicles slowly grind the rough surfaces of crushed rock into filler and binder and surface material which protects the stones from further wearing and makes a smooth surface. Automobiles, being propelled from the wheels, have the effect of tearing up the crushed rock fragments. Moreover, rubber tires do not grind the surface and produce the surface dust needed for binder and filler, and what dust is pro-

duced is thrown into the air by the fast-moving wheels and carried away by the winds.

The availability of surfacing material is also an important factor. Only 25 per cent of the cost of sand-clay road is for surfacing, as compared with 84 per cent for brick and 76 per cent for Portland cement concrete. If sand and gravel need to be hauled long distances as in some regions, brick may be fully as cheap as concrete.

Several other cost factors need to be considered in choosing the type of road construction. One is the cost of the power for driving the vehicle. The average combined " rolling and air resistance " of the best paved road surfaces—concrete, asphalt, brick, wood block—for a vehicle traveling on pneumatic tires at a rate of 25 miles per hour, according to tests made at the Iowa Engineering Experiment Station, is 27 pounds per ton of loaded vehicle; for the best gravel roads, 45 pounds per ton; for ordinary gravel roads, 55 pounds per ton; and for ordinary dirt roads, 63 pounds per ton. The comparable indexes for gasoline consumption per ton-mile are 0.96, 1.20, 1.33 and 1.44 respectively. The Bureau of Public Roads has estimated that the saving in gasoline alone on 366 miles of paved road in Connecticut would pay for the cost of such a surface in 20 years, with interest figured at 5 per cent. To this saving must be added the saving on tires, broken axles and other wear and tear on the vehicles.

The present is the era of the automobile in America. For the year 1899, the U. S. Census reported the manufacture of less than 4000 motor vehicles; for 1909, about 130,000; for 1919, not quite 2,000,000; and the Bureau of Public Roads reports 4,325,000 for 1925. Of this number, 482,000 were motor trucks. In 1920, the motor vehicle registration in the United States was 9,232,000; for 1925, it was 19,954,000. On highways where recent counts have been made, from 1 to 2 per cent of the vehicles have been horse-drawn. Between 1920 and 1922, highway traffic increased nearly a half in California and Connecticut state highways. Since 1922 it has probably doubled. Motor-bus and motor-truck traffic has probably increased several times since 1920.

The Bureau of Public Roads has estimated, after a special study of the highway traffic problem of Cook County, Illinois, that by 1930 there will be one car for every 5 persons in the city of Chicago. There was one for every 24 in 1920 and one for every

10 in 1924. Figure LXVIII is the Bureau's estimate of highway traffic conditions in 1930 on the various roads leading into Chicago. On several roads, the average traffic will run over 20,000 cars per

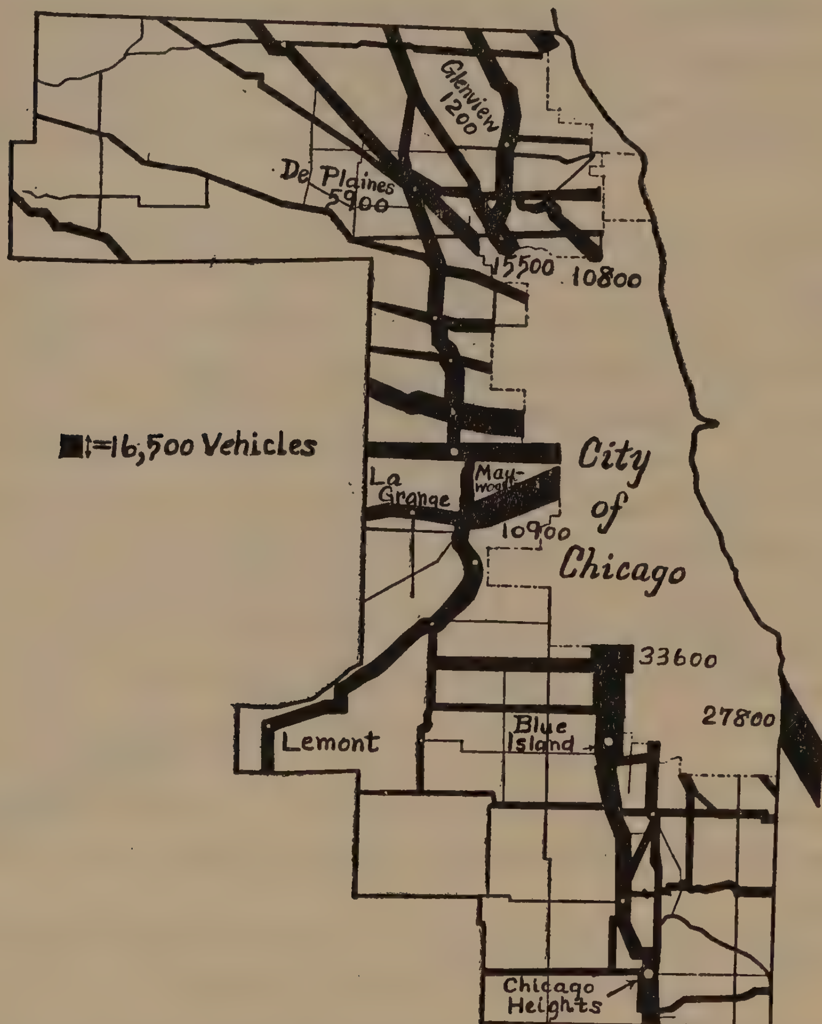


FIG. LXVIII. Forecast of Traffic in Cook County Highway System in 1930.

(From Fig. 23 of *Report of a Study of the Highway Traffic and Highway System of Cook County, Illinois*, made by the U. S. Bureau of Public Roads coöperating with the Cook County Highway Department. Used by courtesy of the Bureau of Public Roads.)

day. Either new highways must be built or the traffic will be congested beyond human endurance.

The 250,000 miles of railway in the United States are capitalized at $20,098,000,000. To build the 172,000 miles of interstate highway now laid out will cost fully that amount at present prices. To improve the proposed intercounty highways will cost nearly as much. Then there are the 2,500,00 miles of county and local highway. Assuming that the road system of the United

States is half depreciated at any time, the investment in it will surely exceed by many billions our investment in railroads. Will the public stand for it? There can be little doubt that it presently will. As long as people keep on buying automobiles, they will keep on wanting good roads; and they will soon reconcile themselves to the idea of paying what is necessary to get them. The Bureau of Public Roads has calculated that the railroad freight charges on the 88,000,000 ton-miles of traffic on the Connecticut highways from September to September, 1922–23, would have been $1,620,800, and that the railway passenger charges of the 1,439,000,000 passenger-miles of traffic in the same period would have been $41,285,000, making a total of $42,306,600. Over a 12-year period, the cost of maintenance of way for the railroads of the United States averaged 13.3 per cent of total receipts. Applying this percentage to the $42,306,600 would give $5,763,000 as available for maintaining a road system with the same carrying power. This represents 19.2 per cent of the estimated $30,000,000 value of the Connecticut road system exclusive of right-of-way, which is surely a much larger percentage than is necessary to maintain a road system. If this figuring is sound, maintenance of way is an appreciably smaller element in highway transportation than in railway transportation; and if highway transportation is more expensive than railway transportation, it is because of other factors than maintenance of way. Highway cost is therefore not likely to be the limiting factor in highway transportation.[1]

It is frequently stated that a large proportion of highway traveling these days is luxury consumption. There is no doubt much truth in this. Studies made in five areas, all of them heavy traffic areas, indicate from 63 to 73 per cent of usage of passenger cars as "non-business." If county and local roads were included, the percentages would be considerably lower. Admitting that automobile travel is largely luxury consumption would not condemn it, nor presage its decline. The incomes and levels of living of the American people are rising constantly, and this seems to be the form which most of the expansion is taking at present. The saying was spread abroad by a Chautauqua entertainer a few years ago that "the normal ambition of every right thinking American

[1] Analysis made by Bureau of Public Roads, *yearbook of U. S. Department of Agriculture*, 1924.

family is to have a boy, then a girl, and then a Ford." Already it has been found advisable to elaborate and dress up the Ford a good bit; and a larger percentage of the people each year are wanting a more expensive car.

The most important problem confronting highway transportation to-day is raising the money for road improvements. The total highway revenue collected in the United States in 1921, according to Table XXXVII, was $711,000,000; in 1924, roughly $900,000,000. These figures do not include receipts from sale of bonds, which in 1921 amounted to $438,000,000. The rural highway indebtedness of the United States in 1922 was $1,222,000,000. We are probably expending over $10 per capita, or $50 per family, or $75 per motor vehicle, on our roads each year. A properly improved road system would require several times this expenditure, probably $300 per motor vehicle. The table shows how the problem is being met. Motor vehicle licenses are being increased, and more gasoline taxes are being collected. The motor vehicle taxes are graduated and classified according to the weight and power and type of the vehicle. This means that the cost of maintenance of highways is being distributed more and more according to the use made of them. This means in effect that a person provides in part for the roads upon which he expects to travel when he buys his car, likewise when he fills his tank with gas. The federal government has been collecting automobile taxes direct from manufacturers since the War, and turning the receipts into the general treasury. These should have been turned into a federal road fund. Now the tax has been reduced almost a half. This should not have been done. That the cost of highways should be borne out of federal and state funds for the most part is proved by whatever figures are available on this

TABLE XXXVII. SOURCES OF HIGHWAY REVENUE, UNITED STATES, 1921 AND 1924

Sources	*1921 (millions)*	*1924 (millions)*
Federal aid and forest-road funds	$ 79	$ 90
Property taxes	416	415
Motor vehicles' license fees	119	225
Gasoline taxes	4	75
Miscellaneous taxes	94	95
	$711	$900

point. The average length of passenger car trips within the state of Connecticut in 1922–23 was 47 miles, and of motor-truck trips 31 miles. From 90 to 95 per cent of the passenger cars traveling on state highways in four areas were city-owned. Surely such highways as well as a large part of the country highways should in large part be constructed with state and federal funds.

Motor Transportation.—An important phase of the highway transportation problem is motor-truck and motor-bus transportation. Figure LXIX shows the motor-bus lines in Maryland. In the Indianapolis market, nearly a third of the hogs in 1923 came to the stockyards in trucks. Between 93 and 98 per cent of the fluid milk supply of Minneapolis, St. Paul, Milwaukee, Cincin-

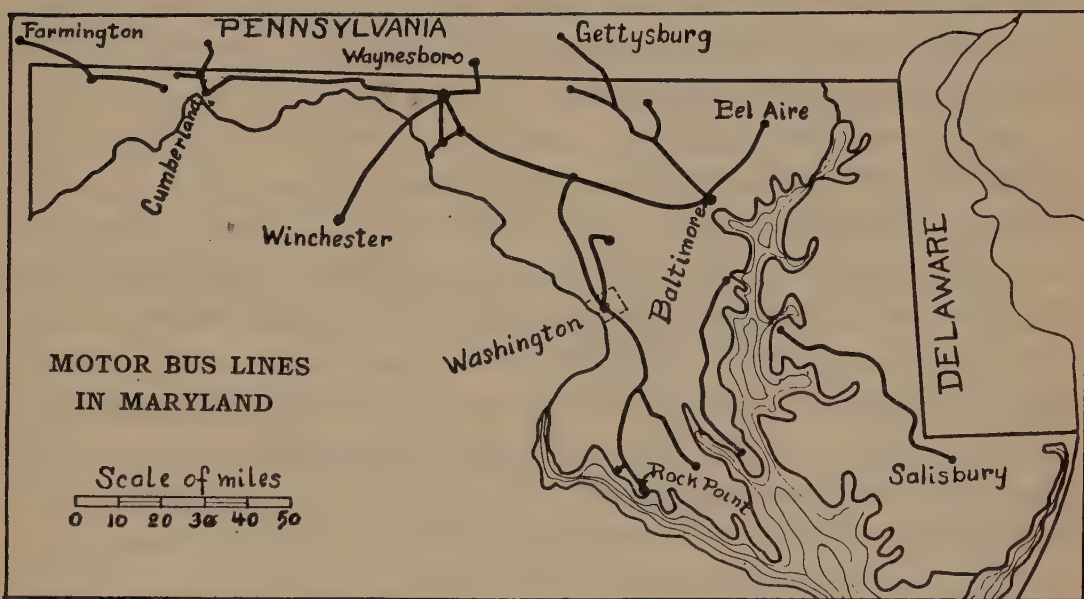


FIG. LXIX. Motor Bus Lines in Maryland.

(From Fig. 54 in the article in the 1924 *Yearbook of the U. S. Department of Agriculture.* Used by courtesy of the Bureau of Public Roads.)

nati and Indianapolis comes to market in trucks. Most locally grown fruits and vegetables come to our large city markets by truck.

Part of this motor transportation service is replacing horses; part of it, railway transportation. There can be very little question as to the desirability of the former. It is giving new market outlets and facilities for travel to whole communities of rural people. Many thousands of inland villages have been put upon the map by it. Cross-country routes of this sort for the most part serve as feeders for the railways. This is true for freight and express as well as for passengers. The principal problem is with

respect to the traffic which competes with the railways. Mile for mile and ton for ton, actual transportation is much cheaper by rail than by truck. A train load of coal would cost perhaps twenty times as much to haul a thousand miles by truck as by rail. For short hauls and small loads, however, the truck has some important offsetting advantages. It can call almost anywhere and deliver almost anywhere, thus saving local drayage costs, and also an extra loading and unloading at either or both ends of the trip. Trucks can stop anywhere along the route and pick up or drop off packages. A small amount of freight can be carried in this way at much lower cost than if a whole train had to be moved. This is especially important in the case of passenger traffic. One motor bus may easily carry all the traffic there is over many lines, and it is cheaper to operate this bus than a whole passenger train, however small.

In general, motor-truck rates are considerably higher than freight rates. The rates on hogs to Indianapolis are a good example of this. From 20 miles out, the truck rates are 20 cents per hundred as compared with 14 cents by rail (single-deck cars); from 30 miles out, the comparison is 30 to 16½; from 40 miles out, the comparison is 40 to 18. The longer the haul, the greater the difference. Yet in spite of the difference, the trucking radius for hogs in this market and for potatoes in Minneapolis and St. Paul markets is 40 miles and over. In a proposed schedule of truck rates presented to the Minnesota Railway and Warehouse Commission, most of the rates for all classes of freight on a 97-mile line were 10 cents per hundredweight higher than the rail rates from the same towns. In the towns very near the terminal, the rates were only about 6 cents higher than the rail rates, and for the town at the end of the line, they were actually lower than the rail rates by amounts varying from 2.5 cents on fourth-class freight to 9 cents for first-class freight. On another line proposed by the same company, the rates were higher throughout an 80-mile trip on fourth-class freight, lower on the other three classes of freight for towns farthest from the terminal,[1] and higher for these same classes of freight for the towns nearer the terminal. These rates show the effect of efforts to meet railway competition. Truck rates are usually very much lower than express rates on perishable shipments, with the possible exception of milk and cream.

[1] *Railway Age*, March 27, 1926, p. 968.

Passenger rates are nearly equal in most regions, but like freight rates vary with the competition. On certain bus lines in Illinois, the fare ranges from slightly more than 4 cents per mile to 6 or 7 cents per mile.[1] In Minnesota, the passenger rates are slightly lower per mile than the rail rates. Probably the cost of service is higher than the cost of railway service, and motor passenger rates will therefore tend toward a level somewhat higher than railroad fares. Mr. Britton I. Budd, President of the Chicago, North Shore and Milwaukee electric line, believes that the motor-bus rate should be from one-third to one-half higher than the rail rate if the motor bus is to be completely self-supporting.[2]

It is often said, of course, that these rates are lower than they should be because motor transportation is not at present paying its share of highway cost. There is some truth in this. But we must not overlook the fact that we would have to have the highways anyway, in most cases just as expensive highways, to take care of the non-commercial traffic, and hence the only highway costs properly chargeable to the motor transportation are the extra upkeep and depreciation costs.

Motor transportation in this country will increase in importance as the years go by; but not over all routes. Many lines have already been started that failed to make a place for themselves; and more will suffer the same fate. Before very long, their proper use will come to be understood. It seems probable at this time that motor trucks will come to be used at least under the following circumstances:

(1) Short cross-country hauls between railroad lines and to points not supplied with railway service. Areas too sparsely settled to obtain a railroad come under this description.

(2) Short hauls paralleling railway lines for less than carload lots. The Pennsylvania Railroad has established a motor-truck system of its own for service of this sort and that named under No. 1 above. Freight is shipped in carlots to certain stations, and delivered from there by trucks to intervening points in less than carlot quantities. Their freight service is much more rapid as a result, and goods are reaching their destination with less damage and deterioration in transit.

(3) Trucking into local markets from the surrounding farming area for radii from 10 to 60 miles.

[1] *Railway Age*, April 24, 1926, pp. 1167–8.

[2] *Ibid.*, p. 1162.

(4) Long-distance transportation of special commodities. The moving of household goods is a case in point.

(5) Within cities at and between congested terminals.

Motor buses will find their greatest usefulness in the rural districts in cross-country traffic and in areas with inadequate railway service. They will prosper under somewhat similar conditions in cities. It is clear that in many cities people prefer to ride in buses rather than in surface street cars, and are willing to pay a higher fare. For one thing, the buses make faster time, and they often travel on the pleasanter streets. The higher fares also make their service somewhat more exclusive. Under such circumstances, motor-bus lines may prosper in direct competition with street-car lines. The sure result of such division of traffic is higher street-car fares. But the increase in variety and frequency of service may be worth all that it costs. Somewhat the same description may apply to motor-bus service paralleling railway lines. The motor-bus lines follow more interesting routes than the rail lines, and offer a better chance for sight-seeing.

Inland Water Transportation.—In a new country, inland waterways are of inestimable aid to settlement. Rivers furnish the only means of ingress into large interior regions of Africa and South America. A heavily wooded region is open to trade only through rivers in its early stages of development. The rubber forests of Brazil would have waited long for exploration were it not for the Amazon and its many navigable branches. The furs of northern Canada are brought to market in canoes. Settlement back from the Atlantic coast followed the rivers exclusively in the beginning. The tobacco of the Virginian plantations could never have reached Europe otherwise. The early settlement of the great interior valley of the United States was possible only because of the Ohio River and the Mississippi and its many branches. Long before the first steamboat appeared on the Ohio in 1811, the settlers had lined its banks with farms, and corn, wheat, tobacco and whisky and other products were being sent back upstream to market at Pittsburgh. The coming of the steamboat spurred river traffic tremendously. At one period, there were over a thousand steamboats on the Ohio and Mississippi Rivers. Cincinnati and Louisville as well as Pittsburgh became thriving river towns. The steamboats were able to travel upstream as well as downstream, and the upstream markets were the more important at the start.

The success of the river traffic turned attention to improving waterways and supplementing them with canals. The great transportation problem of the day was connecting the Ohio Valley and the Great Lakes with the Atlantic seaboard. New York solved it first in 1825 with the completion of the Erie Canal connecting Buffalo with Albany. This canal was phenomenally successful from the start. The tolls collected paid for the construction of the canal several times over. The great stream of westward migration and of supplies went out by way of this canal and the Great Lakes, and a stream of returning produce soon followed. For several decades, the Erie Canal carried more traffic than any river in the world. Pennsylvania in its effort to compete with New York constructed a composite route, partly canal, partly rail, and partly river, connecting Philadelphia and Pittsburgh. Maryland and Virginia in 1828 started the Chesapeake and Ohio Canal paralleling the non-navigable Potomac River. Ohio began canal-building in 1825, then Indiana, Illinois, Michigan and Wisconsin. The objective of these later canals was to connect the Ohio and the Mississippi with the Great Lakes and thence with the Atlantic. But none of these other canals was particularly successful, and most of them eventually went out of use. The Chesapeake and Ohio Canal, completed to Cumberland only in 1850, finally went out of use altogether only a few years ago.

The principal cause of the decline of canal transportation was the success of the railroads. By 1840, pieces of railroad were in operation in nearly every state between Georgia and Maine and west to the Mississippi. By 1850, there were 9021 miles in operation, and 23,061 miles were added in the next decade. Not only did canal building largely cease, but steamboat traffic in the rivers declined also. The high point in lower Mississippi River traffic came early in the fifties, and a little later on the upper Mississippi. In 1858 there were over a thousand steamboat landings at St. Paul. Traffic was heavy for some time afterwards on the Mississippi above St. Anthony Falls clear to St. Cloud, and upon the Minnesota River. The first railroad was built in Minnesota in 1863. By 1870, over a thousand miles had been built. The steamboats led the way and the railroads followed.[1]

A further cause of the decline of river traffic was the increasing use made of the Great Lakes as a waterway. Railroads were built

[1] Mildred L. Hartsough, *The Twin Cities as a Metropolitan Market*, p. 82.

to connect with the Great Lakes ports of Chicago, Milwaukee, Detroit, Toledo, Cleveland, Buffalo, Duluth and Superior. The opening of the iron and copper mines of the Lake Superior region furnished a great impetus to Great Lakes traffic. As early as 1890, a greater tonnage of freight was passing through St. Mary's Canal at Sault St. Marie than through the Suez Canal. By 1900, the St. Mary's Canal tonnage had more than doubled the Suez tonnage. Heavy bulky freight, such as iron ore and coal, which can be loaded and unloaded mechanically, has been transported on the Great Lakes at a rate of fifty cents per thousand ton-miles, which is almost as low a rate as ocean freighters have ever made.

The decline in river traffic has usually been attributed at the time it has happened to the growing size of carrier demanded by modern commerce, and hence vast sums have been spent upon widening and deepening canals and inproving rivers. New York has recently spent $150,000,000 upon the Erie Canal; but the traffic is even less than it was before the canal was deepened. Over $600,000,000 was spent upon improving the Mississippi between 1896 and 1920. Probably an equal amount has been spent upon all other rivers combined. But the improved rivers are used only for pleasure excursions in most cases.

Inland waterways are to-day used only under the following circumstances:

(a) In regions not yet developed and supplied with railways.

(b) In regions long occupied, but not yet supplied with railroads because of the poverty of the people or their industrial backwardness. This accounts for the great use of the rivers of Russia and China.

(c) Upon rivers deep enough so that ocean-going vessels can make inland river ports, such as Montreal upon the St. Lawrence, Rosario upon the La Plata, and Manaos 850 miles up the Amazon. Short ship canals, such as the Manchester Canal, 28 miles long, can be built to serve similar purposes.

(d) Upon large inland lakes, such as our own Great Lakes, the Caspian, and the large lakes of Central Africa.

(e) Upon rivers and canals so located as to carry a large volume of slow-moving freight, like the Rhine in Europe.

(f) Upon canals that greatly shorten ocean routes, like the Suez and the Panama Canals, or even the Kiel Canal cutting through the Danish peninsula, or that provide passage around

falls upon important watercourses, like the Soo and the Welland Canals.

(g) In densely populated regions with low wages.

Some of the important limitations upon inland water transportation are the following:

(a) Many of them are frozen over during part of the year. The St. Lawrence waterway is open only 7 months of the year. In the late summer, many streams have very low water. This means that railroad facilities must be provided to take care of the traffic of the rest of the year. Hence only *the additional cost of the competing traffic* of the railroads is properly charged against it.

(b) Water transportation is too slow for perishable or valuable freight and for passenger traffic. One of the reasons that river traffic is slow is that river courses are generally tortuous. The railroads always get this traffic in summer as well as in winter.

(c) Much of the traffic originates at or is destined to points away from lake and river ports. Transshipment is expensive and destructive.

(d) Many river courses run in the wrong direction. The Mississippi runs crosswise of most of the traffic in the United States.

(e) The costs of improvement and maintenance of many river courses are very high.

Many look forward to a much greater use of the inland waterways of the United States as the population grows. This is very doubtful. The trend in Europe to-day is toward less rather than more use of streams for transportation. The most interesting improvement project in the United States is the deepening of the St. Lawrence-Great Lakes waterway so as to permit ocean vessels to enter all the harbors of the Great Lakes. This project meets fairly well the conditions for use *c*, *d*, *e* and *f* in the above analysis. No doubt it will shortly be carried through, and will in due time cause an appreciable shifting of growth in industry from the Atlantic states to the Great Lakes region. Its effects will take time to appear, and will not be nearly as great as the proponents of the project now believe. The principal reasons for this are that the railroads will get all the light traffic anyway, and the heavy traffic is mostly outbound with insufficient return cargo. In spite of these limitations, it is by far the most promising of the improvement projects now proposed. It is doubtful if any of the other projects should be seriously considered.

Railway Transportation.—In the United States, at least, the largest transportation system at present, with the possible exception of highway transportation, is railway transportation. Professor Eliot Jones in his *Principles of Railway Transportation* describes the magnitude of our railway system as follows:[1] "Our 257,425 [2] miles of railway line if laid parallel would make a 78-track railroad running from New York to San Francisco, or a 10-track railroad running around the earth at the Equator. Our 2,300,000 freight cars would make four solid trains of cars running from New York to San Francisco. Every 46 persons in the United States have one freight car serving them, and every 1600 persons one locomotive. The volume of freight handled in a year equals 3750 ton-miles per person."

The United States is preëminently a country of railroads as well as of automobiles. Its 257,425 miles of railway are nearly two-fifths of the world's railway mileage. The United States has a third more railways than all of Europe with only one-fifth as large a population. The United States has 25 miles of railroad per 10,000 inhabitants; Europe only 5. The only countries exceeding the United States in railroad miles per 10,000 inhabitants are Australia with 50, Canada with 46, Argentina with 27. Reduced to an area basis, the United States has 89 miles of railroad per 1000 square miles, Europe 52, Australia 9, Canada 10, and Argentina 20. Europe on the average has about the same mileage of railroad per 1000 square miles as Texas, South Dakota, California and Colorado; but Belgium has 479 miles of railroad per 1000 square miles, Germany 230, and Great Britain 195. The latter figures are to be compared with those of New Jersey at 310, Pennsylvania and Massachusetts each with 260, Ohio with 220 and New York with 180.

The industrial districts of Europe are therefore as well supplied with railroads as those of the United States. The difference is principally in the agricultural and more sparsely settled portions of the two continents. The Europeans of such areas depend more upon canals, rivers and roads. Time is too valuable in the United States for such slow methods of travel.

Another factor in the rapid railroad development of the United

[1] P. 3.

[2] Mileage figure is from 29th Annual Report, Interstate Commerce Commission, 1925, p. 97.

States and other new countries has been the stimulus given to it by the state and national governments. In carrying out its program of westward expansion and tying the East and West together, the United States found nothing so effective as the building of railroads. Between 1850 and 1871, the federal government gave a total of 150,000,000 acres of public land as free grants to the railroads to encourage building lines in new territory. Canada even went so far as to build a system of railroads. To-day over half of the Canadian railway mileage is owned by the government and operated as one system known as the Canadian National Railways.

Although the European countries generally are less well supplied with railways than the United States, they probably make fuller use of what they have and run more trains over them in a day. The difference is perhaps most striking in the case of the passenger service. Because of the density of population of most of Europe, there is a large volume of second- and third-class local traffic which is transported at low rates. The first-class passenger service is inferior to that of the United States. There is proportionately much less traveling in Pullmans. Sleeping cars and dining cars are American innovations.

The great era of railroad building in the United States was from 1850 to 1910. Only 9051 miles were built by 1850, and since 1915 the mileage has been at a standstill or decreasing if anything. In the decade of the thirties, Pennsylvania and New York took the lead in railway building. In the next decade, the New England states joined energetically in the race. In the decade of the fifties, Ohio, Indiana and Illinois led the way. By 1860, Ohio and Illinois had outstripped Pennsylvania in mileage. Also by the end of this period, all the southern states except Arkansas had railroads. One had reached the Missouri River at St. Joseph. The early building was of short local railroads designed to connect a few important points. In this decade, the process of combining these short railroads end-to-end began. The New York Central became a through line from Albany to Buffalo, and the Pennsylvania Railroad a through line from Philadelphia to Pittsburgh. In this period was also made the first land grant to railroads, of 3,750,000 acres of land from the public domain to encourage the building of a railroad from Chicago to Mobile, Alabama.

The outstanding events of the decade of the sixties were the

completion in 1869 of the Union Pacific and Central Pacific connecting the Mississippi River Valley with the Pacific coast, the further combinations making the Pennsylvania and the New York Central in effect through lines to Chicago, and land grants to railroads, principally to the transcontinental railways. The last federal land grant made was to the Southern Pacific in 1871.

In the decade of the seventies, somewhat over 40,000 miles of new railroad was built, and in the decade of the eighties, over 70,000 miles. It was in these latter decades that all of the remaining transcontinental lines except the Great Northern, completed in 1893, and the Chicago, Milwaukee and St. Paul, completed in 1909, were built. The largest increases, however, were in the two rows of states just west of the Mississippi River. Also the railway net in the North Central and North Atlantic states more than doubled in its intensity during this period. The railroad building of the nineties and since has been of this latter type mostly. Only 30,000 miles were built between 1890 and 1900, and 50,000 between 1900 and 1910.

All during the period from 1870 on, the process of combining railroads into through lines went on rapidly. By 1880, competition between parallel lines between New York and Chicago had become very severe, and this led to another sort of combination namely, that of competing lines into rate and traffic pooling agreements. Early in the seventies, state legislation in the Middle West had begun attacking the railroads for their high rates and discriminatory practices. The federal government began its regulation of the railroads with the passage of the Act to Regulate Commerce in 1887, which created an Interstate Commerce Commission. Later acts increased the powers of this commission. Freight and passenger rates declined rapidly after 1870, and no doubt reached levels in many cases at which it was impossible for the railroad to operate. Rate-fixing has therefore become the principal function of the Interstate Commerce Commission. Rates were raised very greatly in the period of 1918 to 1921. The severe decline in prices, especially of farm products, in 1920 and 1921 precipitated a demand for the lowering of these rates. Whether or not they can be lowered again is one of the problems of the future.

The technical improvements in railway transportation were a large factor in its success. In the earlier decades, the railways

were built in several gauges. By 1890, the standard gauge of 4 feet, 8½ inches, had become generally adopted. The early railroads used iron rails. In the decade of the eighties, most of the railroads changed to steel rails. This made it possible to use larger cars and load them more heavily, and also use larger locomotives. In 1890, there were no locomotives weighing 200 tons; to-day many weigh more than 400 tons and a few more than 450 tons. Along with these changes, heavier and heavier steel rails have been used. The average trainload has increased from 175 tons in 1890 to 646 tons in 1920. This is partly due to longer trains, partly to larger cars, and to some extent to heavier loading of cars. In 1870, the average capacity of box cars was 10 tons; in 1920 it was 37. In 1902, the average capacity of all freight cars was 28 tons; in 1920 it was 42 tons. Freight cars were loaded to 59 per cent of capacity in 1902; to 62 per cent of capacity in 1920. The average carload in 1901 was 16.5 tons; in 1920, it was 26.7 tons.[1] Increases in size of cars and weight of carloads means reduction in cost per unit of actual commodities hauled because of resulting lower per-unit costs of construction and maintenance of cars and lower per-unit power requirements. Longer trainloads have the same effect, and in addition, lower per-unit train crew costs. Double-tracking of railroads is a very great improvement if the traffic is heavy enough to warrant it. About a sixth of the roadbed of the United States is double-tracked. One of the developments for the future is undoubtedly the electrification of a considerable portion of our railway system.

Our failure to resume railway building since the War has rather generally given the impression that the days of extensive building of new railroads are largely over. This impression is probably correct. The principal reason for this is that practically all parts of the United States are supplied with nearly all the railroads they are likely to need. Most of the areas remaining for agricultural development have been provided with railroads largely in advance of settlement. Forest regions are generally provided with far more railroads than they need after the timber is removed. Thousands of miles of logging railroad have been discontinued since 1915. In regions with sparse agricultural populations, the motor truck has the advantage over the railroads. Very few new lines will be built in the future to give better service to areas remote from the rail-

[1] Eliot Jones, *Principles of Railway Transportation*, pp. 401, 406, 407.

roads. Counties in Illinois, Minnesota, or Nebraska now without railroads will probably never get them. Rumors of railway location surveys and the great railroad that is coming will soon be a thing of memory. The railway net will not thicken any more. If anything, the opposite will take place, and many little used spurs and crosslines will be abandoned. The motor truck will provide the short-haul service for all such areas.

The future of the railroads in the United States, however, is entirely secure. They will continue to haul all the through freight and long-distance passengers. The main railway lines will find their volume of traffic, especially of freight traffic, increasing rather than decreasing. The motor trucks will in large part serve as feeders for these main lines. Future railway construction will be mostly double-tracking, improving roadbeds and building stronger bridges and larger terminals. The railroads have little more to fear from the water competition. The increase in volume of traffic on the main lines will presently reduce costs and improve service. It will be something of a problem, however, to bridge over the gap between now and such time as the volume of traffic catches up with the overbuilt condition of some railroads. Undoubtedly some of the overbuilt lines will pay very small dividends on their capital stock.

Although the railroads of the United States are on the whole efficiently managed, and great progress has been made in technical improvements, there is still much that needs to be done. The average freight car in the United States is engaged in the actual hauling of freight only about 40 days in each year. It spends approximately 100 days on loading and unloading tracks, another 100 days in the process of being switched or being transferred from one railroad line to another, 35 days in process of being repaired, and about 90 days waiting in yards for shippers' orders, or waiting for trains to be made up, or idle for other reasons. There certainly is a chance for improvement here. Cars can also be loaded more nearly to capacity.

The greatest of all weaknesses in our railway system is its lack of unified service and management. Some plan must be found for securing a greater measure of coöperation between the different lines. Passenger and express train schedules must be harmonized. Better facilities must be developed for interline transfers. It is too late to rectify some of the mistakes made in building parallel

competing lines. Some of the evils associated with it can be partly corrected by a system of classifying the traffic and routing it over the proper line. Perhaps one line can be used mostly for heavy freight and the other for light traffic. The United States government made its first move in the direction of unification when it provided in the Esch-Cummins Act of 1920 for voluntary consolidation of the railroads into a limited number of systems. Professor W. Z. Ripley of Harvard University was engaged by the Interstate Commerce Commission to make a preliminary analysis of the problem. He proposed consolidating the railroads into nineteen systems. His plan puts the transcontinental lines into four systems, the trunk lines (connecting New York, Philadelphia and Baltimore with Chicago) into another four systems, the New England railroads into one system, the southern railroads into three systems, etc. The railroads have offered many objections to this plan, but no doubt the one which is finally adopted will not be greatly different from it.

Another serious problem of the railroads is financing. In the era of great railroad building, the promotors engaged in many doubtful financial practices. In the era of combination that followed, the capital stock of the railroads was copiously watered. The Interstate Commerce Commission, under the circumstances, could not tell how much a railroad property was really worth when it undertook to fix rates that would yield a reasonable return upon the investment. The Valuation Act of 1913 instructed the Interstate Commerce Commission to make a physical valuation of the railway properties of the country. This has proved a much larger task than anticipated and the work is not yet completed. A further effect of the reckless financing was the ultimate bankruptcy of many of the railroads. The most recent instance of this is the bankruptcy of the Chicago, Milwaukee and St. Paul railroad, the result largely of the " milking " of the parent corporation by the subsidiary corporations that built the extension to the Pacific coast. The public, in consequence of the foregoing, has lost much of its faith in railroad securities, so that it has been extremely difficult until recently for the railroads to raise the funds needed for purchasing the new equipment required to handle the constantly growing volume of traffic. This caused a severe car shortage during the early months of the War, and again in 1922 and 1923. The Esch-Cummins Act requires that railroads obtain a

permit from the Interstate Commerce Commission before issuing any new securities. For this and other reasons, the railroads are now raising all the funds needed.

The gross income of the railroads of the United States averages about 70 per cent from freight, 20 per cent from passenger, and the rest from mail and express.

The data on marketing costs given in the last chapter show railway transportation costs ranging from 25 per cent to 3 per cent

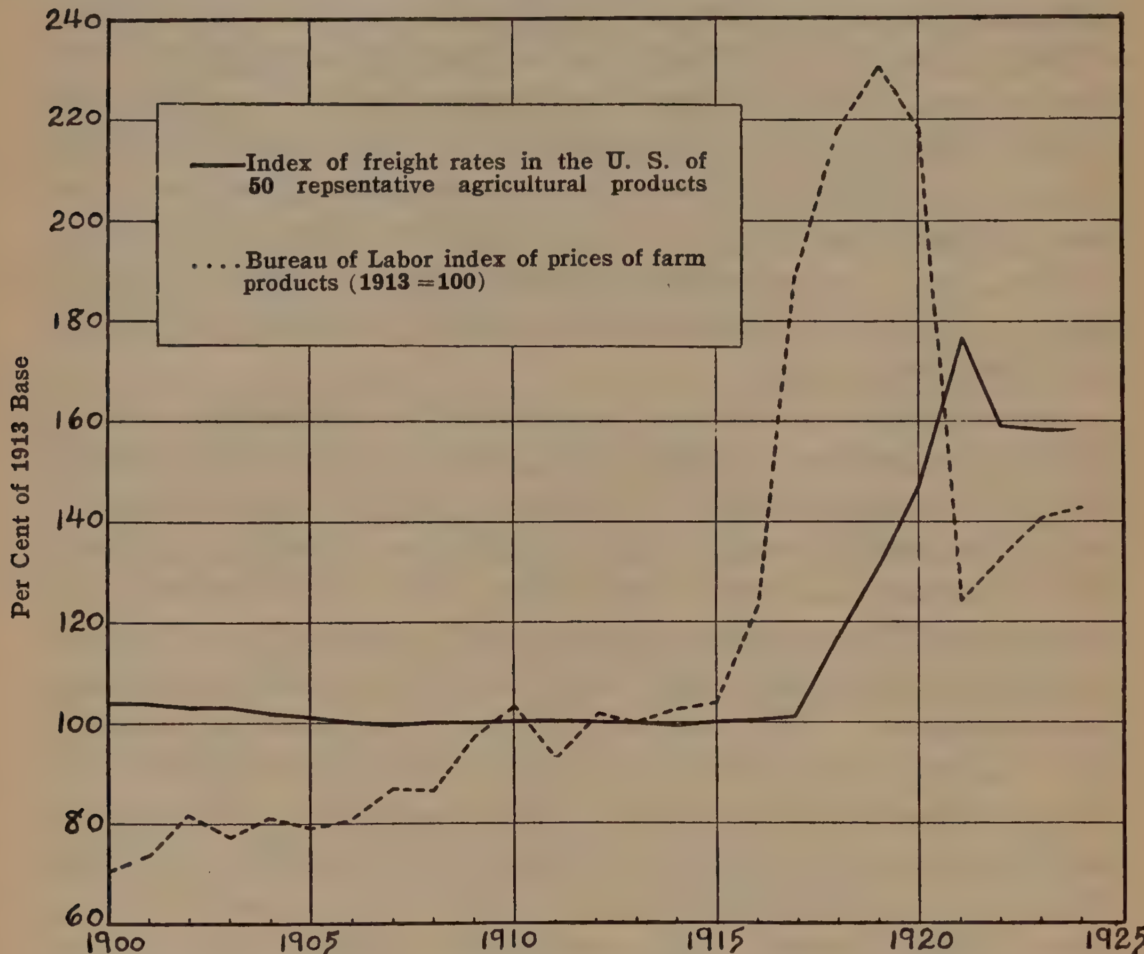


FIG. LXX. Changes of Freight Rates on 50 Agricultural Commodities from 1900 to 1923 Compared with Changes in the Price of Farm Products for the same Period. (Indexes for freight rates from the *1924 Yearbook of the U. S. Department of Agriculture*, p. 1163, and index of price of farm products from the reports of the Bureau of Labor Statistics.)

of the consumer's price, being highest for such commodities as oranges and lowest for such commodities as furniture. The average for all commodities studied by the Commission of Agricultural Inquiry was 6.05 per cent in 1914. Figure LXX shows that since then, freight rates have risen and remained largely at the new

level, whereas the farm products price level after rising fell only halfway back to the 1914 level. If 6.05 per cent was a true ratio for farm commodities in 1914, then about 3.5 per cent must have been a correct figure in 1917, 9.9 per cent in 1921, and 7.7 per cent in 1924. It is easy to see why farmers have been complaining about freight rates.

City Trucking.—A surprisingly large part of the cost of transportation of many products is absorbed in trucking to and from railway stations and docks, public markets, cold storage warehouses, and between jobbers' warehouses and retail stores. The trucking required depends a great deal upon the layout of the city and the location of all the foregoing with respect to each other. Many of our larger cities have long outgrown the areas used for public markets, so that congestion greatly hampers traffic.

An equally important item is delivery to the consumer. Table XXXVIII gives data on the delivery costs, expressed as percentages of gross sales, of a number of types of business enterprises in Washington, D. C., in 1916. The fact that some of the enterprises manufacture their product and others only deal in it does not affect the comparability of the figures. The reason that figures are lower for some than for others is that the purchasers do more of their own delivering.

The increasing use of motor trucks for city trucking has changed the problem somewhat. It is doubtful if it has reduced the ex-

TABLE XXXVIII. DELIVERY COSTS OF VARIOUS TYPES OF BUSINESSES IN WASHINGTON, D. C., IN 1916 [1]

Type of business	*Percentage of delivery cost to gross sales*
Ice	45.6
Soft drinks	20.2
Brick	19.9
Bakeries	19.8
Laundries	15.3
Coal and wood	15.2
Ice cream	14.9
Lumber	6.8
Groceries and meats	4.4
Hardware	3.0
Furniture and carpets	2.8
Department stores	1.5
Wholesale meats	1.1

[1] E. F. Hartley in a study published by the U. S. Census Bureau.

pense of the service, but it has surely increased its speed and frequency.

A recent study of trucking costs shows that the costs of operation other than depreciation increase very slowly as the mileage per day is increased. For a 3- to 3½-ton truck running 20 miles per day, the estimated cost on this basis was $9.08 or 45.4 cents per mile. For a run of 100 miles per day, the cost was $17.88, or 17.9 cents per mile. Increasing the distance run each day by five times thus increases the costs per day only about two times. Depreciation is nearly proportional to distance traveled.[1] Another study showed a cost of 41 cents per hundredweight for a 75-per cent load, as compared with 31 cents for a full load, the length of haul being 55 miles in both cases.

Trolley Transportation.—Trolley transportation made its important growth in the United States in the period between 1890 and 1910, first in the cities and then in interurban traffic. In the cities, it supplanted the horse-driven car, and no doubt also the bicycle. Most cities of 15,000 or 20,000 or over in the United States now have street-car service, and many smaller cities have interurban lines passing through them which give more or less local service. Interurban transportation has cut in severely upon the local passenger traffic of railroads in the East and Middle West, and to some extent upon light freight traffic.

The introduction of the street car represents an important step in the history of large American cities. The immediate effect was a relieving of the population pressure upon the downtown districts. Cities at once began to grow more freely at their peripheries. Street-car lines began to be built to new sections of cities to hasten their development.

As cities become very large, although the street cars may relieve the congestion of the downtown population, they do not relieve the traffic congestion. New York, Philadelphia, Boston, London and Paris have coped with the problem by building subways. These not only take the traffic off the streets, but they greatly increase the speed of travel. Elevated lines, such as in Chicago, do not leave the streets as free for surface traffic as do subways.

In a small or moderate-sized city, all the street-car lines pass through the downtown districts. In larger cities, much of the traffic originates and ends farther out. Large factory districts

[1] *Railway Age*, March 27, 1926, p. 922.

away from downtown often become the termini of important cross-lines.

The future of street-car transportation is qualified somewhat by competition with the private use of automobiles and with motor-bus transportation. Motor buses will surely be used freely for furnishing service for suburbs and other portions of cities not populous enough to support street-car service. They will operate, if not prohibited, upon the better residence streets which have been kept free of street cars. Also by running upon streets midway between street-car lines, they can pick up a great deal of traffic that would otherwise go to the street-car system. Even running upon the same streets, they can pick up considerable traffic of the sort that is willing to pay extra for quicker and better service. If a city is needing additional street transportation, there may be ample reason for permitting this to be provided by motor buses. If, however, the present street-car lines can handle it simply by adding extra cars, then it will be a serious question as to what is the best public policy. Dividing the traffic will raise the cost of transportation to everybody; but it will give a much better service. Unfortunately many of the people who use street cars need to be more concerned about the cost than the quality of service.

Another important aspect of the problem is that more people will ride downtown to work in their automobiles if the motor buses are refused permits to operate, and this will have the effect of greatly increasing the traffic congestion at the busy hours of the day. The street cars have more to fear from this source than from the motor buses; so also have cities which have a congested traffic problem on their hands. It seems a reasonably safe conclusion that only a small part of the increasing street traffic of our growing cities will be handled by building new street-car lines.

Interurban lines were greatly overbuilt in the period from 1900 to 1915. Many of them are now in the hands of receivers. Their misfortunes are in good part due to the increasing use of automobiles and motor buses. But some of them would have failed anyway. Interurban lines probably have a secure position in densely populated regions in connecting cities not well supplied with railway service. They have the great advantage over the railways of furnishing more frequent service in smaller units; and the advantage over motor buses that they can operate more cheaply.

Trolley freight has had a limited field of service in hauling

local produce from points near-by to large city markets. Whether it can now compete with motor-truck service remains to be seen.

The magnitude of the trolley transportation in the United States may be judged by the fact that the income from it in 1918, computed by the methods outlined in Chapter III, was 12 per cent as large as the income from the steam railways. It was employing in the same year 15 per cent as many persons.

Street-car companies are subject to the same regulation of rates and service as steam railway companies, but there is always the question as to whether the state or the municipality shall do the regulating. The trend at present is toward state regulation.

Pipe-Line Transportation.—The United States has over fifty thousand miles of pipe-line for transporting petroleum from the oil fields to the refineries and to principal consuming cities such as St. Louis, Chicago, Cleveland, Philadelphia and New York. The Oklahoma and Texas fields also connect with ports on the Gulf of Mexico where the oil is transferred to tank steamers. At frequent intervals along these lines are pumping stations which force the oil forward. These pipe-lines have been declared to be "common carriers," which means that they must transport oil for everybody even though they may be owned by the Standard Oil Company, as most of them are.

Ocean Transportation.—Table XXXIX shows the gross tonnage of merchant vessels under registry of different nations in 1914 and in 1924 engaged in foreign and coastwise trade. The increase during this period was 30 per cent, a remarkable increase, due, in large part, to the World War. The nearly 200 per cent increase for the United States was surely due to this cause. Also the victor and the neutral nations gained at the expense of the defeated nations. Great Britain and the United States owned 50 per cent of the world's tonnage in 1914, and 55 per cent of it in 1924.

The fortunes of the merchant marine of the United States have been exceedingly variable. In the colonial period, shipbuilding was an important New England industry, and most of the products of the colonies were carried to England in American bottoms. Until 1830, the merchant marine kept up well with the growth of foreign trade. By 1860, however, only about two-thirds of the foreign trade of the United States was carried in American bottoms. From then on the decline was rapid, from a fourth in 1880,

TABLE XXXIX. GROSS TONNAGE OF MERCHANT VESSELS, 100 TONS AND OVER, UNDER REGISTRY BY NATIONS IN 1914 AND 1924 [1] (000's Omitted)

	1924	*1914*
Great Britain and Ireland	19,106	19,257
United States	15,957	5,368
Japan	3,843	1,708
France	3,498	2,319
Germany	2,954	5,459
Italy	2,832	1,668
British Dominions	2,773	1,798
Holland	2,556	1,496
Norway	2,505	2,505
Sweden	1,255	1,118
Spain	1,240	899
Austria-Hungary	—	1,056
Denmark	1,036	820
Greece	761	837
Belgium	561	352
All others	3,147	2,440
Total	64,024	49,090

to less than a tenth in 1914 at the beginning of the World War. The percentages by years since 1914 are 14, 17, 21, 22, 36 and 43 in 1920. Since 1920 the percentages by years are 1921, 36; 1922, 37; 1923, 35; 1924, 36.[2]

One factor in the progress of American shipping has been government interference. In the period from 1800 to the Civil War, the federal government protected and subsidized the merchant marine in various ways. The same was true during the period of our participation in the World War and immediately following. Federal laws now regulate the hours and conditions of labor upon ships engaged in exclusively American trade. It is believed by some that this hampers our shipping industry. The failure of our shipping to keep up with our foreign trade following the Civil War is partly due to the removal of protection; partly to the fact that capital in this country was scarce, and what was available could earn larger returns in exploiting our mines and our forests; but probably most of all to the shift from wooden to steel construction, in which Great Britain had the advantage over us at this period. It is doubtful whether we can retain the position we now hold in ocean

[1] *Statistical Abstract of the United States*, 1924, p. 396.
[2] *Ibid.*, p. 417.

shipping without some form of subsidy or protection. American capital is still able to earn larger returns in other industries. Congress has thus far refused such a subsidy. Our merchant marine has already declined from 17,062 gross tons in 1922 to 15,957 gross tons in 1924. Opinion is divided between those who are willing to let the principle of comparative advantage work itself out even in this case, and those who think that this decline should be prevented for military or other reasons.

A very large part of the shipping of the United States has always been engaged in coastwise trade. Because of the length of our coast line, much of the coastwise trade of this country represents longer trips than that classified as foreign in Europe. In 1910, the shipping employed in lake, river, and coastwise trade in the United States was eight times that engaged in foreign trade. A very large part of this shipping was upon the Great Lakes. By 1920, however, the foreign shipping had run ahead of the other. Combining all merchant vessels of the United States in 1920 gives a tonnage of 130 per 1000 inhabitants. This figure is to be compared with 184 for Sweden, 245 for Denmark, 262 for Netherlands, 396 for Great Britain, and 824 for Norway. France has 78, Italy 62, and Japan 52.[1] When the figures are reduced to a comparable basis, therefore, the United States does not appear to be far behind Europe, especially if the nations with an important fishing industry are excluded. The average size of all steam and motor vessels in the United States in 1920 was 3480 tons, of Great Britain 2240 tons, of Netherlands, 1920 tons and of Norway 1240 tons.[1]

The extent to which sailing vessels nowadays figure in the shipping of various countries depends largely upon the extent to which the trade is of the coastwise type. Only one per cent of the tonnage of Great Britain is represented by sailing vessels, as compared with around 10 per cent for the United States, France, Norway, and Denmark, a third for Italy, and a half for Finland.

Ocean transportation is the cheapest of all forms of transportation. The freight rates on wheat from Hutchinson, Kansas, to Galveston, Texas, in 1924 were 40 cents per bushel, and from Galveston to Liverpool only 10 cents; from Bozeman, Montana, to Seattle, Washington, 38 cents, and from Seattle to Liverpool, only 21 cents.[2] The freight rate on wheat from Dickinson, North

[1] Huntington and Williams, *Business Geography*, pp. 458–9.

[2] *U. S. Department of Agriculture Yearbook* 1924, pp. 1158 and 1163.

Dakota, to Duluth was 28 cents in 1924, and from Montreal to Liverpool, 10 cents. If the Great Lakes waterway was completed, the rate from Duluth to Montreal would probably be about 4 cents.

The effect of the cheap ocean transportation is to bring the products of Europe nearer to the Atlantic seaboard than are those of our own West or even Midwest. Unless trade barriers are interposed, the people in Boston, New York and Baltimore will eat lemons from Sicily and perhaps beef from Argentina in place of depending upon domestic supplies. Under the circumstances the interior of a great continent is indeed isolated. Its surplus products sell at low prices in the home market and its imported commodities at high prices. Prices of food are about the lowest in Denver, Colorado, of any city in the United States; and the prices of clothing and house furnishings about the highest. Any proposal to improve a waterway and bring ocean transportation into the interior of a continent therefore deserves careful consideration.

Ocean freight is divided between line and tramp steamers. Only a very small proportion is carried by sailing vessels. The line steamers may be compared to the fast passenger trains. They maintain a schedule and make certain ports of call almost with the regularity of the railroad train. They carry passengers, mail, express, and freight of high specific value. The line steamer must maintain its schedule whether or not it has a full cargo. The tramp vessels are comparable to freight trains. They carry mostly full cargoes of the bulkier, less expensive products. The tramp vessels carry by far the greater part of ocean freight. They do not maintain a schedule, but go wherever traffic calls. They are routed from port to port, always bearing in mind the possibility of picking up a new cargo at or near the port of discharge of the last cargo. Long tie-ups or long trips in ballast are expensive, and managers of tramp steamers are very careful to keep their ships supplied with earning cargoes as much of the time as possible. Consequently freight rates for a particular voyage may be made high or low depending upon the prospects for a cargo at the port of discharge. Managers keep advised from day to day through shipping agencies of the movements of their own and rival steamers and the freight condition in all parts of the globe. The shipowner may solicit cargoes for himself, or he may depend upon brokers to furnish cargoes for

him. A commission is charged for such service. A large grain crop in the Argentina or in Russia will cause ship managers to compete keenly for loadings to South American or Black Sea ports, for they know that they are certain of a profitable return cargo there. The tramp steamer is a free lance following the trade. It may spend years before a cargo is picked up which brings it back to its home port.

Foreign Trade of the United States.—Table XL shows the imports and exports of the United States by classes of products. More than 50 per cent of our exports consist of food products, crude and manufactured, and crude materials. The most important single class of exports is finished manufactured products, but crude materials are a close second in value. During the past few years, the export of the crude materials has increased somewhat faster than that of the manufactured goods. This tendency reflects the continued readjustment of foreign industry to postwar conditions. Similarly our imports of crude materials have increased more slowly than our imports of semi-manufactured and finished goods. Our principal imports are sugar, raw silk, coffee, rubber and textiles. These are mainly tropical products and manufactured goods of high value. Our exports consist largely of raw cotton, iron and steel manufactures, petroleum products, meats, wheat and wheat flour, and automobiles. These are mostly raw products for manufacture, heavy machinery, and goods for which our large-scale production methods give us an advantage.

TABLE XL. EXPORTS AND IMPORTS OF THE UNITED STATES BY ECONOMIC CLASSES [1] (000's Omitted)

DOMESTIC EXPORTS

Fiscal year	*Crude materials*	*Crude foodstuffs*	*Manufactured foodstuffs*	*Semi-manufactured*	*Finished manufactures*	*Miscellaneous*	*Total*
1921	$975,706	$673,334	$685,025	$410,167	$1,626,849	$7,847	$4,378,928
1922	981,355	458,611	587,987	437,730	1,292,307	7,101	3,765,091
1923	1,202,044	257,478	583,292	563,718	1,477,759	6,424	4,090,715
1924	1,326,341	392,691	573,492	610,668	1,588,052	6,405	4,497,649

DOMESTIC IMPORTS

Fiscal year	*Crude materials*	*Crude foodstuffs*	*Manufactured foodstuffs*	*Semi-manufactured*	*Finished manufactures*	*Miscellaneous*	*Total*
1921	838,217	300,181	368,311	361,747	620,051	20,641	2,509,148
1922	1,161,075	329,809	387,419	552,677	662,947	18,820	3,112,747
1923	1,385,983	363,032	530,208	720,729	771,300	20,814	3,792,066
1924	1,236,092	424,873	521,600	655,888	749,346	22,164	3,609,963

[1] From *Statistical Abstract*, 1924, p. 426–7.

TABLE XLI. EXPORTS AND IMPORTS OF THE UNITED STATES BY CONTINENTS[1] (000's Omitted)

Year	North America	South America	Europe	Asia	Oceanica	Africa
			EXPORTS			
1921....	$1,129,579	$273,325	$2,363,899	$532,615	$112,766	$72,847
1922....	915,654	226,075	2,083,357	448,970	101,945	55,776
1923....	1,086,168	269,318	2,093,415	511,498	146,423	60,671
1924....	1,090,041	314,252	2,445,300	514,592	156,505	70,294
			IMPORTS			
1921....	754,849	295,623	764,942	617,862	35,499	40,373
1922....	822,454	358,763	991,203	826,886	48,517	64,924
1923....	1,001,517	467,421	1,157,056	1,019,811	59,200	87,061
1924....	995,146	466,074	1,096,087	930,708	48,945	72,992

[1] From *Statistical Abstract*, 1924, p. 430–1.

Our principal customer is Europe, where more than half of our exports are sold. The bulk of these go to the North European countries and particularly to the United Kingdom. The other nations of North America, particularly Canada, have become of increasing importance as buyers of our exports within the last few years. We also buy more goods from Europe than from any other continent; but our import trade is much more evenly divided between the other continents than is our export trade. Our exports and imports to all North American countries combined about balance; but we buy a third more from South America than we sell there. The European trade is reversed, for we sell Europe more than two times as much product as we buy. We buy almost twice as much from Asia as we sell there. Table XLI shows the distribution of our exports and imports by continents.

Among the ports of the United States, New York is by far the most important, as indicated in Table XLII. It is near the American terminus of the North Atlantic route, which is the most important ocean route in the world. New York is also the terminus of the most important internal trade route of the United States. New Orleans, the second port in the United States, is the gateway for the bulk of the imports from South America and Central America. A large share of the banana, sisal, coffee, sugar and petroleum imports enter the United States by way of New Orleans. Its exports are composed largely of cotton and some grain from the Southwest.

The bulk of the Pacific coast exports are raw materials, lumber, and grain. These ports receive imports from Asia and the East Indies, and export some finished goods to them.

Foreign Trade of Other Countries.—Table XLIII gives the value of the imports and exports of a number of the important trading nations. The United Kingdom has the largest foreign commerce of any nation. It imports principally raw materials and food products. About three-fourths of its exports are manufactured products. The next most important export commodity is coal.

France's imports consist mainly of coal, machinery and wool, which are all used in manufacturing. Its exports are chiefly manufactured goods of high value, consisting of such commodities as textiles, steel products and automobiles. Since the War, France has surpassed Germany in volume of foreign trade, and now ranks third among the world's nations. Japan's exports consist largely of raw silk and silk and cotton textiles and large quantities of handmade articles. Her imports are largely raw materials, food products and machinery. The South American exports are largely food products, and the imports are mainly manufactured goods bought principally from Europe.

TABLE XLII. CARGO TONNAGE OF WATER-BORNE IMPORTS AND EXPORTS OF IMPORTANT AMERICAN PORTS, 1924[1]
(000's Omitted—Tons of 2,240 Lbs.)

Port	*Imports*	*Exports*
New York	10,355	11,890
New Orleans	4,477	3,688
Baltimore	3,564	1,858
Philadelphia	3,107	2,299
Buffalo	2,944	854
Boston	2,009	334
Galveston	1,569	1,652
San Francisco	1,244	1,839
Port Arthur, Texas	1,077	1,234
Los Angeles	1,009	3,207
Seattle	389	755
Portland	96	1,285

[1] *Statistical Abstract*, 1924.

TABLE XLIII. FOREIGN TRADE OF IMPORTANT COMMERCIAL NATIONS, 1922 (From Putnam's Economic Atlas, 1925) (Converted to Dollars at $4.86 Per Pound Sterling; 000's Omitted)

Country	*Total imports*	*Total exports*
United States	$4,024,080	$4,208,760
United Kingdom	4,875,066	4,000,752
France	2,126,250	1,836,594
Germany	1,475,010	944,298
Japan	1,007,478	872,370
China	861,192	596,808
Canada	830,088	963,252
Italy	829,116	489,888
British India	764,964	879,174
Argentina	677,484	606,042
Mexico	328,536	471,420
Brazil	236,196	333,396
Cuba	197,802	355,266

TABLE XLIV. FOREIGN TRADE OF THE UNITED STATES WITH SELECTED NATIONS, 1924 [1]

COUNTRY	VALUE OF TRADE (*000's omitted*)		CARGO TONNAGE OF WATER-BORNE TRAFFIC (*000's omitted—tons of 2,240 lbs.*)	
	Exports	*Imports*	*Exports*	*Imports*
United Kingdom	$982,035	$366,477	8,229	1,644
Canada	624,001	399,068	10,327	6,485
Germany	440,538	139,258	3,225	1,071
France	281,664	147,637	2,908	457
Japan	250,320	340,061	3,008	220
Cuba	199,779	361,721	2,446	4,589
Italy	187,040	75,004	2,975	401
Mexico	135,077	167,087	1,037	13,242
Argentina	116,998	75,298	1,506	712
China	109,189	117,886	1,645	334
Brazil	65,207	179,335	1,287	648
British India	34,901	103,277	401	71
Chile	31,378	98,679	956	2,234
United States	$ 4,497,649	$ 3,609,962	52,261	40,899

[1] *Statistical Abstract*, 1924, pp. 434 ff.

Table XLIV indicates in values and tonnages the foreign trade of the United States with thirteen important commercial countries. Our imports exceed our exports principally with tropical and the oriental nations.

Ocean Trade Routes.—The great bulk of the ocean traffic follows well-defined trade routes. The shipowner always seeks the most direct line between two ports unless ocean currents, winds or land projections force him from this path. The shortest route between North America and Europe is far to the north of an east-and-west line. The eastern coast of North America lies more nearly in an east-and-west than north-and-south direction, and consequently is not far from the "great circle" route to Europe. Ships from all Atlantic ports skirt the coast of North America on their journeys to Europe. The North Atlantic route is the most important trade route of the world. Nearly all ships between North America and Europe travel along this path for at least a part of their journey. Even those from ports in the southern part of the United States, West Indies and the Panama Canal find this the best route to Europe, although a more direct route would be farther east a little. The facilities for coaling along the east coast are excellent and there are always possibilities for additional traffic at some Atlantic port.

The second most important world route is the Mediterranean-Asiatic route which connects the North European ports with the Mediterranean and Asiatic ports via the Strait of Gibraltar and the Suez Canal. After passing through the Suez Canal and Red Sea, the route branches to points in India, East Indies, Australia and the Orient.

The route to the eastern South American ports is divided into two branches, the most important one connecting directly with North Europe, the other swinging northwestward from Brazil to New York. From the west coast, the routes pass through the Panama Canal to New York or to Europe. There is a minor route through the Magellan Straits.

The principal Pacific routes are two in number. The first is the northern route from Pacific coast points following the great circle along the southern coast of Alaska to Japan and China. The second and much longer route touches at the Hawaiian Islands and Guam where considerable freight and passenger traffic may be obtained, and terminates at Manila. There is also a less important South Pacific route from Pacific coast points and the Panama Canal to Australia.

The South African route connects North Atlantic ports with Asiatic points. It is much longer than the Suez route, but there

is South African traffic to be handled. The traffic from North America and Europe over this route meets off Cape Verde and

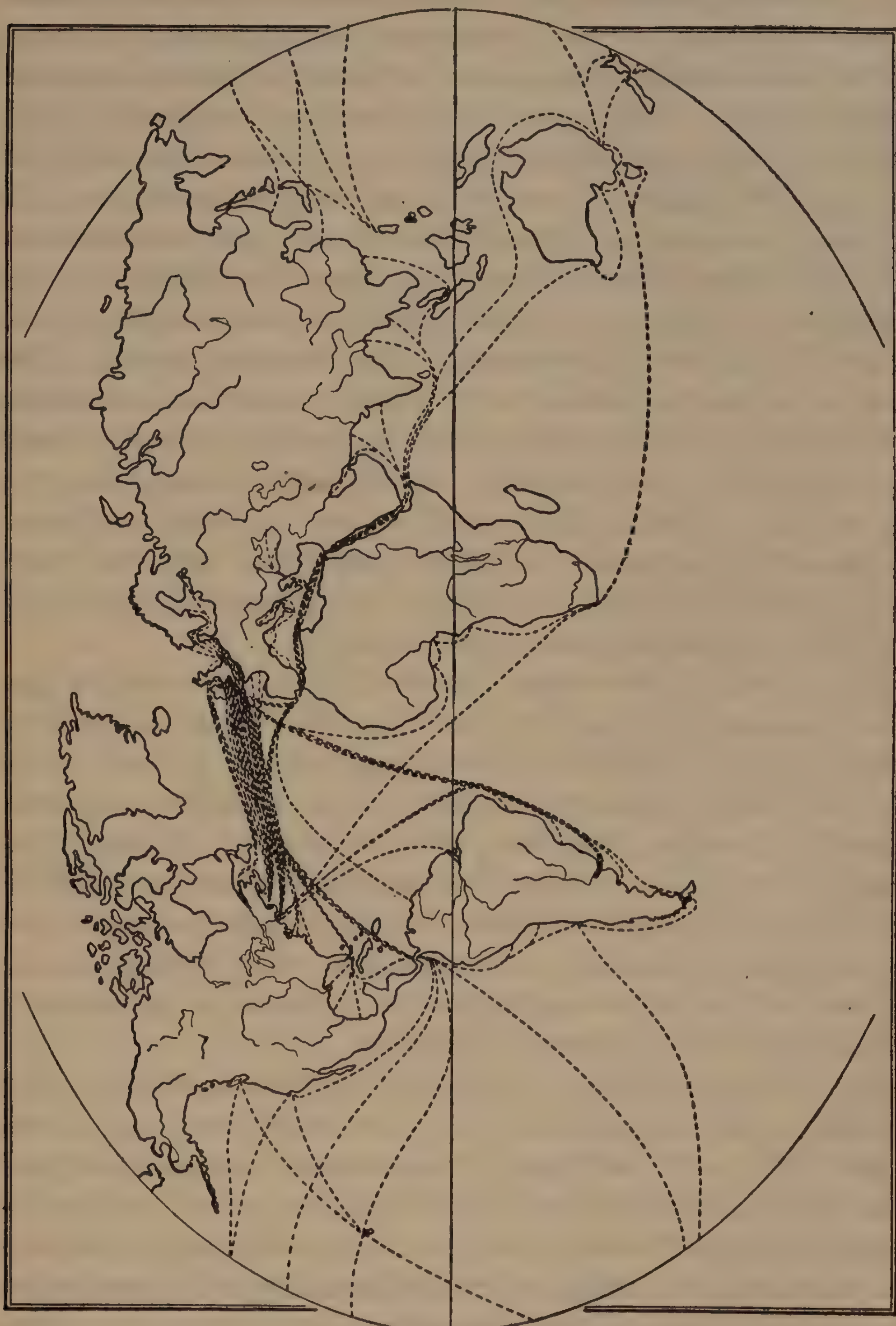


FIG. LXXI. Important Ocean Trade Routes of the World.

continues together from that point to the Cape of Good Hope, where the route again divides toward Indian and Southern Asiatic points and toward Australian and New Zealand ports.

Figure LXXI shows the most important ocean trade routes.

General Considerations.—All the forms of transportation taken together make up a tremendously complex and varied industry—almost as complex and varied an industry as all primary production taken together. Of the human and natural resources entering into the production of final goods, at least a fifth are absorbed in transportation. The most difficult problem involved in transportation is that of the proper division of labor between the different types of carriers and the coördination of their services. For any given commodity in a given situation, one form of transportation is most economical. It may, of course, be difficult to find out which it is. There is no doubt about coal and iron ore moving between Duluth and Cleveland in the summer months. One cannot be so certain about butter between northern Minnesota and Cleveland in the summer time. Moreover, between most areas a large list of commodities varying all the way from very bulky to very valuable, from mail parcels to whole trainloads, from almost imperishable to highly perishable, must be transported. To find for all these combined, the one form of transportation which is most economical, is not so simple.

Again, for each of the stages into which the road to market and to the consumer is broken up, such as from farm to the local shipping station, from the local shipping station to the central market or factory, from the factory to the jobber's warehouse, thence to the retailer, and thence to the consumer, a different form of transportation may be most economical. Shifting commodities from one type of carrier to another is sometimes a wasteful and time-consuming operation and sometimes not. Whether it is better to continue with the same type of carrier or to transship is a special question to answer in each case.

Under a system of free competition and no regulation, such questions as the foregoing find their proper answer very slowly at times. Two or three types of carriers may compete for years for the same traffic over very nearly the same route. Or the less economical form of transportation may persist merely because it has the initial advantage. But determining in advance what transportation system should prevail may be so nearly impossible that no public agency could safely undertake it. To-day many public utility commissions are being asked to determine whether bus lines shall be allowed to operate in competition with certain railroads or street-car lines. Are any of them wise enough to do

it? The future therefore holds many interesting developments in the matter of competition between types of carriers.

Improvements in transportation increase the volume of transportation very rapidly, because they make it economical to exchange an increasing volume of goods, and to exchange them over longer distances. It is commonly said that they lower the prices of goods to the consumer and raise the prices to the producer. While this is true so far as any pair of producing and consuming areas is concerned, they also frequently have the effect of bringing new areas of greater comparative advantage into competition and lowering the prices in old producing areas. It may also mean increasing the share of the consumer's dollar that goes to transportation. This is illustrated by the following hypothetical case in which two areas are assumed to be potential producers of alfalfa hay for an eastern market:

	ORIGINAL RATES		IMPROVED RATES	
	Cost of production	*Freight costs*	*Cost of production*	*Freight costs*
Area A	\$7 +	\$15 = \$22	\$7 +	\$10 = \$17
Area B	\$14 +	\$ 6 = \$20	\$14 +	\$ 4 = \$18

Area B is much nearer the market than A, and has much lower freight costs. Area A has such favorable climate and soil and so few competing crops that it can produce the alfalfa at as low a cost as \$7 a ton. But even thus it cannot compete with Area B with the first set of freight rates, and hence is kept out of the market. Now let us assume improvements in transportation that lower freight costs one-third. If Area B is going to stay in the market now, it will have to lower its costs to \$13 per ton. Let us assume that it cannot do so because of competing crops. Before the freight costs were lowered, transportation costs represented 30 per cent of the market price; they now represent 59 per cent of the market price. If Area B stayed in the market and produced one-half the crop, the freight cost would be raised to only 47 per cent of the market price. This hypothetical case illustrates what has been happening on a large scale in the world ever since steam was first applied to transportation. The result is that our transportation bill is getting larger and larger, and transportation is taking a larger and larger slice of our dollars. And yet we are

getting our produce at relatively lower prices.[1] Products have also been produced in larger and larger proportions in areas better suited to them. This has increased the available supply of food, clothing, timber and metals, and has been a large factor in the remarkable increase in the world's population since 1800. We can expect improvements in transportation to continue, and all the other results here described to follow.

II. STORAGE

Distinction has already been made between the storage service furnished by primary producers, transportation agencies, merchants and consumers incident to their regular operations, and that furnished by storage specialists. It is only the latter which will be discussed in this section. Storage warehouses are first of all classified as public and private. The former furnish storage at regular commercial rates, and like the railroads must accept all products brought to them in proper condition for storage. The latter are maintained as adjuncts of private enterprises for the purpose of storing their own products. Thus a meat-packing plant may have a cold storage department of its own. Second, storage warehouses are classified as to whether furnishing refrigeration or not. Logically it is just as reasonable to speak of *warm* storage as of *cold* storage. It is just as essential to keep a warehouse for storing potatoes from getting too cold in winter as to keep a warehouse for storing eggs from getting too warm in the summer. As a matter of fact, it is far more disastrous to let the temperature under which apples and other similar fruit commonly said to be kept in cold storage in winter, run below 31° F. than to let the temperature under which eggs are stored run several degrees above freezing point in summer. The purpose of storage of grain is primarily to keep it dry; but it may also be necessary to aërate it at times to keep it from heating. This is done by running it from one bin to another through the elevators. Cotton and wool are stored to protect them from the weather. Furs and clothing are stored to protect them from moths. Coal, coke, iron ore and the like are simply stored in a stock-pile without any protection whatever.

[1] In actual operation, the price of the product could not be lowered as much as here indicated. Instead, the price would be raised somewhat at the farm, and in consequence the cost of production also.

The reasons for storing commodities are primarily three, namely, to balance production and consumption between the seasons of the year, to balance production and consumption between years, and merely to hold goods in safe-keeping till they are wanted again. The storage of household goods and furs comes under this third description.

The extent to which the seasonality of production is a factor in storage may be judged from Tables XLV and XLVI, one showing the movements of butter and eggs in and out of storage, and the other the monthly marketings of wheat, corn, cotton and

TABLE XLV. MOVEMENTS OF BUTTER AND EGGS INTO AND OUT OF STORAGE [1]

CREAMERY BUTTER—NET INCREASE OR DECREASE IN STORAGE HOLDINGS BY MONTHS, 1920 TO 1924

(Thousand Pounds)

	May	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Jan.*	*Feb.*	*Mar.*	*Apr.*
1920....									−15,378	−15,791	−10,013	−5,001
1920....	5,318	39,654	48,919	14,113	−2,173	−11,607	−23,028	−21,068	−17,196	−14,473	−12,371	−7,020
1921....	13,970	40,309	20,847	9,454	−2,176	−12,133	−12,854	−16,717	−13,365	−12,465	−13,469	−5,283
1922....	9,372	54,208	35,741	8,888	−15,359	−22,823	−26,084	−20,954	−10,697	−7,212	−4,086	−1,576
1923....	6,864	52,656	39,006	954	−6,614	−19,645	−24,964	−21,209	−15,053	−5,399	−2,005	1,071
1924....	13,435	51,836	59,934	22,322	−2,946	−18,476	−34,186					

CASE EGGS—NET INCREASE OR DECREASE IN STORAGE HOLDINGS BY MONTHS, 1920 TO 1924 [1]

(Thousand Cases)

	Mar.	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Jan.*	*Feb.*
1920......											−1,200	−313
1920......	93	2,013	3,008	1,604	125	−500	−1,077	−1,457	−2,014	−1,416	−365	00
1921......	1,883	2,983	1,935	690	71	−395	−941	−1,889	−1,977	−1,514	−710	−166
1922......	937	3,698	3,408	1,755	350	−553	−1,684	−2,198	−2,469	−1,946	−1,098	−200
1923......	440	3,284	4,153	2,332	287	−626	−1,146	−2,092	−2,617	−2,101	−1,427	−456
1924......	535	2,984	3,312	1,810	582	−489	−1,369	−2,142	−2,165			

[1] Adapted from Tables 474 and 615, *United States Department of Agriculture Yearbook*, 1924.

hogs. If the producers of wheat, corn, and cotton did not store them at home for a while, the marketings would be still more concentrated within a few months. Storage stocks of fresh and cured pork are about constant from month to month. This means that as between the seasons, production and consumption are pretty well adjusted to each other. The months when most of the butter goes into storage are May, June and July. Eggs go into storage mostly a little earlier, in April, May and June. The storage period for apples is from October to June. In 1911,

the U. S. Department of Agriculture published the following data upon the storage period of several commodities: [1]

Beef	2.3 months
Poultry	2.4 "
Butter	4.4 "
Eggs	5.9 "
Fish	6.7 "

The same article states that 13.5 per cent of the farm production of eggs goes into storage and 25 per cent of the creamery butter; and that 11.5 per cent of the hogs, 4 per cent of the mutton, and 3 per cent of the beef goes into storage as fresh meat. Ordinarily all of one year's stocks of eggs and butter is moved out of storage before the new storage begins; but in some years there is a small carry-over.

The extent to which storage from year to year is significant may be judged from Table XLVII showing variations in production of several crops from year to year. The world production is less erratic than that of the United States, especially for wheat and flax, and international trade evens out the differences considerably. Also consumption of cotton and corn, and to a less extent of wheat and flax, varies with the size of the crop. But even allowing for these adjustments, the carry-over varies from year to year. Table XLVIII shows the approximate carry-over of three important farm crops for the five-year period ending in 1924. The 1921 corn carry-over was more than three times the amount carried over in 1923. The 1920 oats carry-over was less than one-third of that of the following year. A longer period might have shown a greater variation in wheat carry-over than here indicated.

TABLE XLVI. MONTHLY MARKETINGS OF SELECTED AGRICULTURAL COMMODITIES [2]

PERCENTAGES OF YEAR'S SALES—AVERAGE 1919 TO 1923

	Jan.	*Feb.*	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Season*
Wheat	4.84	4.62	3.86	3.58	4.08	4.20	15.30	18.12	15.76	11.60	7.86	6.18	100
Cotton	6.56	4.60	4.32	3.64	3.56	2.78	2.60	3.48	13.32	21.88	19.94	13.32	100
Corn	12.92	11.58	7.82	5.52	7.14	7.98	5.68	6.64	7.12	6.28	8.40	12.92	100
Hogs	11.33	8.77	8.44	7.40	8.67	8.95	8.95	6.09	5.74	7.29	9.15	11.00	100

[1] *Yearbook*, pp. 27–32.

[2] Adapted from *United States Department of Agriculture Yearbook*, 1924, pp. 565, 607, 754, 919.

TABLE XLVII. PRODUCTION OF SELECTED AGRICULTURAL COMMODITIES, 1914 TO 1924 [1]

	COTTON		CORN		WHEAT		FLAX	
	U. S. production (*Thousand bales*)	*World production*	*U. S. production* (*Million bushels*)	*World production*	*U. S. production* (*Million bushels*)	*World production*	*U. S. production* (*Thousand bushels*)	*World production*
1914..	16,135	28,687	2,673	4,042	891	3,625	13,749	94,559
1915..	11,192	20,689	2,995	4,143	1,026	4,166	14,030	103,287
1916..	11,450	19,845	2,567	3,475	636	3,289	14,296	82,151
1917..	11,302	19,675	3,065	4,050	637	3,134	9,164	41,063
1918..	12,041	20,613	2,503	3,470	921	3,148	13,369	61,821
1919..	11,421	21,384	2,811	3,963	968	2,997	7,178	56,611
1920..	13,440	20,875	3,209	4,437	833	3,033	10,752	81,480
1921..	7,954	15,330	3,069	4,054	815	3,317	8,029	63,874
1922..	9,762	18,900	2,906	4,055	868	3,400	10,375	85,772
1923..	10,128	19,300	2,054	4,288	797	3,743	17,060	109,910
1924..	13,153		2,437		873		30,173	117,973

[1] *United States Department of Agriculture Yearbook*, 1924, pp. 754, 606, 569, 639; 1921 *Yearbook* p. 569.

TABLE XLVIII. CARRY-OVER OF FARM CROPS (MILLIONS OF BUSHELS)

	Corn (*U. S.*)	*Oats* (*U. S.*)	*Wheat* (*U. S.*)	*Wheat* (*world*)
1920..............	145	59	120	242
1921..............	301	195	101	220
1922..............	197	118	88	174
1923..............	86	78	112	172
1924..............	107	71	113	

Storage facilities are a very important adjunct of a large central market for such commodities as grain, cotton and wool. Chicago has terminal elevator capacity for 55,805,000 bushels of grain; Minneapolis for 54,900,000 bushels. The grain storage capacity for the United States in 1918 was 1,432,000,000 bushels.

Wholesale receivers make a great deal of use of public warehouses at times. They may obtain supplies of fruit, vegetables, eggs, or butter in larger quantities than the public will take at once, and hence put part of them into storage for a while.

Cold storage rates are given as flat rates for handling in and out, plus a monthly storage charge. Thus the handling charge may be 6 cents per case of eggs received in carload lots, plus 6 cents per case per month. Storage for a few days is therefore very expensive. In 1921, there was cold storage capacity in the amount of 543,573,000 cubic feet in the United States. Of this 256,499,000 cubic feet was operated by packing houses for their own use.

Public cold storage capacity amounted to 193,778,000 cubic feet, and the balance was divided between private storage and a combination of private and public storage.

The Federal Warehouse Act of August 11, 1916, and as amended July 24, 1919, and February 23, 1923, applies to warehouses which store or may store certain agricultural products entering into interstate or foreign commerce. Its provisions are not compulsory; but any storage warehouse of the type described may take advantage of them if it so wishes. The principal advantage of this is that a warehouse licensed by the Secretary of Agriculture may issue warehouse receipts which are more acceptable as collateral for loans than the receipts of warehouses not subject to federal supervision. The Act originally applied to warehouses storing grain, cotton, wool and tobacco; but the Secretary of Agriculture has extended the application of the act to include peanuts, potatoes, broom corn, dry edible beans, dried fruits and nuts. Licensed warehouses are subject to very strict regulations, especially in the matter of issuance of warehouse receipts. Many bankers will accept warehouse receipts only from federal warehouses.

On October 1, 1924, the capacity of licensed warehouses was as follows: cotton, 2,639,996 bales; grain, 36,432,795 bushels; wool, 23,226,250 pounds; tobacco, 551,696,000 pounds; and peanuts, 4285 tons. Over 600 warehouses are licensed.

Improvements in storage have about the same effect as improvements in transportation. They increase the amount of storing that is done, lower prices to consumers and to some producers, and increase the proportion of the consumer's dollar that goes into storage. They make it possible to produce during the period of cheapest production and hence lower the prices to producers during the rest of the year.

Improvements in processes for preserving food, such as canning, evaporating, curing and pickling, also have the same effect. Processing in preparation for storage is a very important adjunct of the storage process.

III. COMMUNICATION

The first important contribution to the remarkable series of technical and economic achievements that has given us our modern system of communication was the invention of the printing press, for this made possible the publishing of newspapers, which still

are our most important medium for communicating information. The first newspaper published in England was the *Weekly News* in 1621. The next event was the organization of a postal service, first, in a small way, in 1638. Modern postal systems in Europe date from the opening of the " penny post " introduced in England in 1840. Before that time, the English government had attempted to make the postal system a source of revenue and charged very high rates, fourpence being the lowest rate charged, and the rate increasing rapidly with distance. In 1840 the principle was introduced of one rate to all parts of the United Kingdom. Following this reform, the number of letters carried increased from 3 per person a year in 1840 to 34 per person in 1880, to 54 in 1899, and 76 in 1924. In a number of European countries, the early postal systems were privately owned and operated, in some cases very efficiently. A number of the early private fortunes of Europe were earned in this way. The postal service of the United States has always been a public enterprise and managed on very nearly a cost basis. In 1912, parcel delivery was added to the system, and greatly increased its usefulness, especially to people living on farms and in remote places. In 1924, the mail service of the United States handled 152 pieces of mail per capita of the population, Great Britain 131, and Germany and Italy (1923) 47.

The various parts of the mail service of the United States are not equally self-supporting. For example, second-class mail, comprising newspapers and magazines, is carried for much less than cost, the justification advanced being that these are our most important disseminators of information. Unfortunately, this policy has also encouraged the publication of a large number of cheap periodicals which are fundamentally advertising media, whose information is often worse than useless.

The electric telegraph, which first came into practical use in 1844, had the effect of making news almost contemporaneous. The Atlantic cable was first successfully laid in 1866, and before long all the continents were joined. In 1921, there were 298,000 nautical miles of cable in 3000 separate lengths connecting the different countries of the world. In 1918, there were 15 direct cables between North America and Europe and 2 between North America, Australia and Asia. Cable lines connect seaports in the same country. The result is that the whole world is now joined in one system of quick communication service. The telegraph

and cable aided commerce greatly from the start. Railroads were able to dispatch their trains much more effectively. Ocean carriers were able to save many long fruitless trips in search of cargoes. The various exchanges of the world could exchange information constantly as to receipts and prices. Buying and selling could be arranged at long range. Shipments could be directed to the proper markets. The people of the United States make little if any more use of the telegraph than do the people of Europe. On an area basis, the United States has only 302 miles of telegraph wire for each 1000 square miles, as compared with 2790 for Germany, and 2190 for Great Britain. But on a population basis, the comparison is 13.5 per 1000 inhabitants for the United States, 8.6 for Germany, and 5.7 for Great Britain. The European systems, however, handle many more messages per mile of line. The telegraph system of the United States is under two managements, the Western Union, and the Postal Telegraph, the former of which has the much larger volume of business. The two managements coöperate very closely.

What the United States lacks in telegraph service as compared with Europe is more compensated for in telephone service. Every thousand persons in the United States has on the average 130 telephones. A comparable figure for Germany is 30; for Great Britain 21; for France 12. The countries nearest approaching the United States are Canada with 98, and Australia and New Zealand with 75 each. Business men in the United States use the telephone in preference to the telegraph because it gives quicker service. More farm families have telephones in the United States than in Europe, principally because they can better afford them, but partly because they are more isolated and need them more. In Europe, only well-to-do families afford themselves the luxury of a private telephone. Telephone service even more than telegraph service needs to be concentrated into a limited number of systems. Having two systems in one city means a very great duplication of lines or else only partial service. The same is true of long-distance service. A very large part of the telephone service of the United States is now controlled by the American Telephone and Telegraph Company, popularly known as the Bell System. The fifty thousand independent companies are all small, and many of them are rural lines organized upon a coöperative basis. The 225,000 employees of the Bell System represent over 90 per

cent of all persons engaged in the telephone service of the United States.

The most recent developments in the field of communication are the aëroplane, which is reducing the time required for transporting letters and other valuable mail, wireless telegraphy and the wireless telephone. Further progress with the wireless telephone may revolutionize this form of communication. Wireless telegraphy has already been of inestimable service to ocean transportation.

SUGGESTIONS FOR FURTHER READING

Clive Day's *History of Commerce* (1917), Chapters XXX and XXXI, gives a general discussion of the development of rail and water transportation. For a more detailed treatment of railway transportation, see Eliot Jones' *Principles of Railway Transportation* (1924), Chapters I and III. Various economic geographies, particularly R. H. Whitbeck's and V. C. Finch's *Economic Geography* (1924), Chapters XV and XVI, Huntington's and Williams' *Business Geography* (1922), Chapters VIII and XXVII, and J. Russel Smith's *Industrial and Commercial Geography* (1922), Part II, Chapters II and XII, inclusive, give discussions of transportation facilities, trade routes, and foreign and domestic trade of the different nations. The indexes of these books should be consulted for reference to particular nations. Putnam's *Economic Atlas* (1925) is an invaluable visual presentation of many of the subjects discussed in this chapter. The best recent discussion of highway transportation is that by T. Warren Allen and others entitled "Highways and Highway Transportation in the United States" in the *U. S. Department of Agriculture Yearbook* (1924), pp. 97–184. *Railway Age*, the weekly transportation magazine, carries a motor transportation section and contains discussions of the latest developments in that field.

PROBLEMS

1. A certain area is a highly specialized dairy section. Railroad rates are raised so that this area decreases its dairy production and produces enough wheat for its own needs. Is this change contrary to the principle of comparative advantage?
2. What is the effect on production of a decrease in transportation rates?
3. What would be the effect on production of butter of a decrease in storage charges? Would butter prices be higher to the producer? To the consumer? Would such a change tend to stabilize prices throughout the year? Why?
4. What would be the effect of the above change on production and prices within a highly specialized area? In an area less specialized?

5. Would butter production increase during the spring or winter months with lower storage rates? Why?
6. In which direction along the North Atlantic ocean route is the bulkiest freight carried? Why?
7. It is said that many ships cross the Atlantic "in ballast." What does this mean? In which direction are such ships moving? Why?
8. Why does the shortest route between San Francisco and Japan run close to the Aleutian Islands?
9. What effect if any do you think the building of the Great Lakes-St. Lawrence waterway would have on New York's traffic? Montreal's? Duluth's? The eastern railways' from Chicago to the Atlantic seaboard?
10. Do you expect an increase in amount of traffic in the future proportional to the increase in the past? Why?
11. Will the composition of our foreign trade change? How? Why?

CHAPTER XXVIII

MALADJUSTMENTS IN PRODUCTION AND THEIR EFFECTS

Chapter XXII, after describing the static and dynamic influences operative in society and explaining the ways in which they interact, stated that the final effect of these influences was to give us a world of constant maladjustment. If everything in society were completely fluid, so that there never was any lag of any kind, there would never be any maladjustments—everything would move into a perfect recombination after every change in external conditions, after every new stimulus to change. On the other hand, if new stimuli to change were to cease coming, eventually every producing agency would find its way into a perfect combination. As it is, little of anything ever gets into the right adjustment, so that if a cross section is taken at any time, one will usually find a wide range in combinations, many of them being rather close to a right combination, but many of them also being considerably on either side of it. In Chapter XXIII, the element of risk and uncertainty was introduced as further complicating the problem of adjustment.

From one point of view, all the maladjustments in society grow out of specialization and production for the market instead of for one's own immediate consumption. Chapters XXIV to XXVIII described the mechanism of exchange and the way in which it functions to keep production and consumption properly adjusted to each other. Considering the magnitude and complexity of the task, the marketing mechanism achieves wonderful results, but it falls far short of meeting the needs of the situation. The fact is that the task of coördination which is put up to the marketing mechanism is so difficult that it is doubtful if any machinery can ever be devised that will at all times function properly. The mechanism required is so involved that it will be impossible to keep its working parts always properly in gear with each other. Hence, as was pointed out in the chapters preceding, some of the most important of the maladjustments are found in the processes of exchange themselves.

It is the purpose of this chapter to analyze the nature and causes of the various types of maladjustment a little further, and then describe their effects. The chapter following will discuss methods of control and elimination of maladjustments.

Let us begin this chapter by listing in order the maladjustments which have been suggested by preceding chapters:

1. Individuals having the wrong occupation or task.

2. An area producing the wrong product or combination of products. This area may be a city or a nation. Looked at from the point of view of the producing unit, this may amount to having a producing unit in the wrong location.

3. A producing unit with the wrong combination of products.

4. A wrong combination of the amounts of the elements of production.

5. Wrong technical methods and practices.

6. A wrong combination of efficiencies of the individual elements.

7. A wrong combination of capacities of the individual elements.

8. A wrong type of business unit and plan of financial organization.

9. The wrong plan of organization for operation, of line, or functional, or line-and-staff organization. The general plan may be correct, but it may not be worked out properly as to details.

10. The wrong size of the business unit, either for a given entrepreneur or manager, or for a given location.

11. Improper handling of risks.

12. All of the foregoing maladjustments as occurring in individual marketing, financial or transportation units the same as in individual primary producing units.

13. Producing units representing different stages in the production process not properly adjusted as to volume and type of product. This includes marketing, financial and transportation units the same as primary producing units.

14. Markets failing to reflect promptly enough in price changes the changes in demand and supply conditions.

The important economic effects of these maladjustments may be included under three heads, effects on *costs*, effects on *profits*, and effects on *outputs*. The common way of observing the different effects of maladjustments is to make comparisons between the costs, profits and outputs of different individuals, plants and

areas at any given time. What in effect is done is to take a cross section of conditions at a point of time and then analyze what is seen. This method will be followed in this chapter. The cross section will be taken in such a way as to enable us to make comparisons between (1) individual establishments in the same area turning out the same product, (2) individual establishments in the same area turning out different combinations of products, (3) individual establishments in the same area turning out entirely different products, (4) establishments in different areas turning out the same products, (5) establishments and industries in different countries, and (6) individual persons. The rest of the chapter will discuss the effects on costs, profits and output under each of the above six heads in the order given.

I. EFFECTS ON COSTS

1. Of Maladjustments Between Establishments in the Same Area Turning Out the Same Product

If there were no maladjustments of any kind, all plants in an area would have the same costs. Differences in costs between plants are therefore proof of maladjustments. Whenever studies are made in any field of production, whether of factories, stores, railroads or farms, differences in costs never fail to appear. In some cases, the range between the highest and lowest costs is very wide; in other cases narrow; but it is always there. Following are some characteristic examples of these ranges taken from different fields of production. Table XLIX shows the number of book-paper mills out of 39 studied in 1916 which had various costs ranging from $55 per ton to over $80 per ton. This is a range of 40 per cent of the average cost, which was $63 per ton. It is interesting to note that 20 of the 39 had costs between $60 and $70 per ton. Costs of copper-mining establishments have wider range, as indicated by Table L. Probably the widest range of all is for cotton, as indicated in

TABLE XLIX. RANGE IN COSTS PER TON OF BOOK-PAPER OF 39 MILLS, 1916[1]

Costs per ton	*Number of mills*
$50 to 55	5
55 to 60	4
60 to 65	12
65 to 70	8
70 to 75	4
75 to 80	4
80 to 85	2

[1] A Statistical Analysis of the Relation between Cost and Price. *Quarterly Journal of Economics*, Vol. 35, pp. 264 ff. Kemper Simpson.

TABLE L. RANGE IN COSTS PER POUND OF COPPER IN 53 ESTABLISHMENTS 1918[1]

Cents per pound	*Number of establishments*
Under 15	6
15 to 17½	7
17½ to 20	8
20 to 22	10
22 to 24	7
24 to 28	8
Over 28	7

[1] A Statistical Analysis of the Relation between Costs and Price, *Quarterly Journal of Economics*, Vol. 35, pp. 264 ff. Kemper Simpson.

TABLE LI. RANGE IN COSTS PER POUND OF COTTON ON 791 SOUTHERN FARMS, 1918[2]

Cents per pound	*Number of farms*
Under 10	3
10 to 15	30
15 to 20	127
20 to 25	249
25 to 30	182
30 to 35	104
35 to 40	40
40 to 45	29
45 to 50	24
50 and over	3

[2] The Cost of Producing Cotton, U. S. Department of Agriculture Bulletin No. 896, L. A. Moorehouse and M. R. Cooper, p. 47.

Table LI. The tendency to bunch around the middle of the range is very pronounced in the case of cotton costs. Table LII shows a wide range for 88 creameries, typical small manufacturing plants; and Table LIII for retail clothing stores, still another type of establishment. In this case, the percentage of the total volume of business handled by each cost group is given instead of the number of establishments. It is generally true that the large bulk of the business is handled by establishments with costs around the middle and below it. The high-cost establishments are ordinarily not very large.

It must be pointed out,

TABLE LII. RANGE IN COSTS PER POUND OF BUTTER OF 88 MINNESOTA CREAMERIES, 1919[3]

Cents per pound	*Number of creameries*
1.5 to 2.0	1
2.0 to 2.5	4
2.5 to 3.0	5
3.0 to 3.5	16
3.5 to 4.0	22
4.0 to 4.5	17
4.5 to 5.0	5
5.0 to 5.5	4
5.5 to 6.0	5
6.0 to 6.5	3
6.5 to 7.0	3
7.0 to 7.5	0
7.5 to 8.0	1
8.0 to 8.5	1

[3] Economic Aspects of Creamery Organization, *Technical Bulletin No. 26*, University of Minnesota Agriculture Experiment Station, J. D. Black, E. S. Guthrie.

however, that a considerable part of the width of these ranges does not represent true differences in costs, but errors or omissions instead. First of all, there are a great many "concealed" costs omitted. Thus two creameries may have differences in apparent costs such as the foregoing principally because one handles a much larger volume of cream than the other. If the costs of hauling the cream longer distances to a larger creamery were taken into account, the differences in costs might largely disappear. Another large part of the differences in costs is always due to errors in computing costs. This is especially likely to be the case with small enterprises like farms and stores, and when one establishment turns out two or more products, as in the case of cotton farms.

TABLE LIII. RANGE IN COSTS PER DOLLAR OF SALES OF RETAIL CLOTHING STORES IN CERTAIN CITIES OF 120,000 POPULATION OR OVER, 1916 TO 1920[1]

Cents per dollar of sales	*Per cent of retail business handled*
Under 20	2.3
20 to 22½	7.0
22½ to 25	31.0
25 to 27½	17.2
27½ to 30	32.8
30 to 32½	8.9
Over 32½	2.7

[1] Adapted from "Expense Levels in Retailing," Horace Secrist, No. 9, Series II, Northwestern University Bureau of Business Research.

Still another large part is due to differences in quality of product. A creamery pays its head buttermaker $4000 per year, and in consequence has labor costs nearly a cent above the average for its class; but perhaps its butter scores 94 instead of 93, and sells for over a cent more per pound. One potato warehouse uses four men at the grader instead of two, and has one-third higher grading costs in consequence; but every car of potatoes passes inspection as U. S. No. 1. One commission merchant has a fourth higher selling costs than another, but secures upon the average a half-cent higher price per bushel for his clients. One suit manufacturer has all buttonholes sewed by hand, another by machine. Sometimes the extra costs are more than repaid in the better price secured for the product; and sometimes not. This is a problem for each producer to decide. At $1.25 per bushel, it may pay to dig potatoes by hand and sort them by hand; at $.40 per bushel neither will pay. It is in the field of merchandising that differences in quality of product are most important. The product in this case is service, and merchandising service varies greatly in qual-

ity. The salesman who sells you something you do not want is not rendering service, but disservice. At the other extreme, a good traveling salesman may half make the success of some of the retailers he serves. But allowing for all these defects in the data, there would still remain a considerable range in costs.

Before proceeding to consider in more detail the reasons for these differences between costs of plants in the same area, let us call to mind the distinction between the physical inputs of the elements of production and the cost-rate for them. The labor costs per unit of output are the product of hours per unit of output times the cost-rate per hour. Any difference in prices paid for the same capacity and efficiency of input elements will be multiplied directly into costs. Hence labor costs may be high either because of poor utilization of labor, or because of high cost-rates. Equipment costs may be high either because of high prices paid for machines, or because of poor utilization of the machines, that is, a low output per machine. Building costs may be high either because of high costs per square foot of floor-space, or because of a low output per square foot of floor-space. In comparisons of costs between plants in the same area, it is sometimes assumed that all have the same cost-rates. This is usually quite contrary to the facts. Any entrepreneur who goes out into the market to buy labor or equipment or supplies or raw material or land, or to let a contract for a building, may make a very good bargain, or a very poor bargain, or any kind of a bargain in between these two extremes. He may buy a good machine, but pay too much for it; or buy a poor one at a moderate price. Or he may buy a good machine at a low price. The more unstandardized the production elements the more of a chance for a good or bad bargain. Land and labor always will be unstandardized, and they make up a large part of the cost of production. Cost-rates in one area vary in some cases merely because of the size of the area. This is particularly true in agriculture. Location of land with respect to a city determines what crops are most advantageously grown and affects the rents that must be paid for all other crops. Near the city, rents are usually higher because the more valuable crops have the advantage there. When we consider the various reasons for differences in costs, we must therefore note to what extent they arise from differences in cost-rates and to what extent from differences in utilization.

Unpredictable Circumstances.—Most obvious of all reasons for differences in costs between establishments in the same area are unforeseen happenings such as strikes, epidemics, fires, floods, hailstorms, frosts, death losses among live stock, which affect one establishment more than another. Even rainfall varies over relatively small areas at times. Escaping a local thunderstorm at a critical period has ruined many a crop of wheat. Mishaps of this kind raise costs either by increasing the inputs or by decreasing the outputs.

Insuring against losses of this kind when possible greatly reduces the cost variations resulting; but it does not altogether eliminate them. Insurance seldom covers all the losses fully. Also insurance rates vary with the different companies.

Some of the foregoing catastrophes are partly preventable. Those entrepreneurs who work to prevent them will have slightly higher costs every year; those that do not will have very high costs in certain years.

Changes in prices of cost-elements and of product must also really be put in the class of unpredictable circumstances. The difference between them and the foregoing is that producers really try to predict them. Even if they assume that they will be the same as last year, they are really predicting them. They are here called unpredictable because few of them can be predicted very successfully. The way in which these produce variations in costs between individual plants is that some predict them one way and some another. The manner of this will be discussed more fully a few pages later.

Adjustments to Local Differences Within the Area.—Scarcely any area is so small that there are not some local differences to which production must be adjusted. In agriculture, soil and drainage vary from farm to farm and field to field. Each field has a crop which it produces at comparative advantage. Any other crop will be grown on this field at relatively high costs. Location with respect to the market gives certain crops the advantage near town. Other crops grown here instead, assuming the same yields, should have higher costs. Even location with respect to the barn is important upon large farms.

Adjustments to local differences are even more important in retailing than in farming. A merchant who established a garage in a downtown department section would find his costs prohibitive.

Minor mistakes of the same general order as this are constantly being made.

Differences in Proportions of the Elements of Production.—Chapter XII made it clear that there is always one least-cost combination of the elements of production. Obviously, then, any producers operating in some other combination will have higher costs, and the farther away from this combination is the point at which they operate, the higher will be their costs. Studies of actual production in factories, stores and mines, and on farms, always show a wide range in proportions of the elements combined. For example, the building site costs of the 88 creameries mentioned in Table XLIX ranged from 5 to 18 per cent of the total costs of making butter; the equipment costs from 6 to 15 per cent; and the labor and management costs from 25 to 41 per cent. A similar study of 71 local potato warehouses showed building and site costs ranging from 5 to 25 per cent of the total, equipment costs from 3 to 18 per cent, labor costs from 15 to 45 per cent, and office and management costs from 15 to 40 per cent. A study of 52 grocery stores in Fargo showed building costs ranging from 1 to 5 cents per dollar of sales, and labor from 5 to 20 cents per dollar of sales.[1] On 22 farms in the same community in Minnesota, the man-labor ranged from 12 to 88 hours per acre of corn, and horse-labor from 31 to 52 hours per acre of corn. In whatever field of industry one looks, the same wide variations are found. It is not likely that all of these can be producing in least-cost combinations. The least-cost combination in each case is probably somewhere between the two extremes; but this need not be true.

In most production analysis, the relation of input to output is really worked out best in terms of particular operations rather than in terms of proportions of the elements as such. To take a simple case, the question becomes one of whether cultivating one's corn 2, 3, 4, 5 or 6 times, or plowing 4, 5, 6 or 7 inches deep, or spraying one's orchard 1, 2 or 3 times a season, gives the least-cost combination. In the merchandising field, it may become a question as to whether it pays to cover a certain territory once, twice or three times a year. In the manufacturing field, it may become a question as to whether it pays to cure a product one, two or three months before selling.

[1] "Fargo and its Grocery Stores," North Dakota Agricultural Experiment Station, April, 1920.

Nearly every production process consists of a sequence of several operations. To take a simple case, the work of a local potato warehouse can be divided into the following operations: buying, receiving, grading, sacking, warehousing, car-loading and selling. If labor costs vary from warehouse to warehouse, the differences will be explainable in large part by analyzing the separate processes. Some have high labor costs for receiving because they have poor equipment, the potatoes being handled mostly by hand. Or grading costs may be high because of very close sorting; or warehousing labor costs may be low because a complete conveyor system has been installed. Under such circumstances, least-cost combinations really need to be worked out for each of the separate processes.

Part of the reason for variation from the least-cost combination is found in the fact that producers after all are not striving for the least-cost combination, but rather for the highest-profit combination. The highest-profit combination is different for different entrepreneurs according to their capacity. An entrepreneur with large capacity will find his highest-profit combination coming with a larger input than one with a small capacity. His profits per unit of output may even be lower than those of the entrepreneur with smaller capacity. He will make up for the lower profits per unit by the larger number of units that he produces. This, however, accounts for only a small part of the variations in proportion of the production elements that one finds in actual practice.

How Adjustments are Made.—Before going further with the discussion of the causes of variation in costs, let us consider briefly how producers actually go about making their adjustments to changing economic conditions. This can be better done in connection with proportions of the production elements than in any other place. It is to be presumed that all producers are constantly striving to attain their highest-profit combinations. Then why do they not find them? The explanation of this lies in the interaction of the dynamic and static elements which was described in Chapter XXII. To begin with, few producers really know their least-cost and highest-profit combination at any time. Those who make it an object to analyze their own costs from year to year sometimes know when they are really lowering their costs and sometimes not; and when they do, they do not always know the reason for it. Few

have access to costs of competing producers; and hence few know whether their own costs are relatively high or low. But even if they did know how their costs compared with the average, they could not tell from this what changes were required in their own organization. As for data such as outlined in Chapters XI and XII, upon the basis of which to compute a least-cost and highest-profit combination for their plant, few indeed have anything approaching them. Although all of them recognize the principle that the cost element whose price is rising should be economized, few of them are able to tell even approximately how much more or less of it should be used with a given change in price.

To illustrate the foregoing, let us take one of the fields in which research has been carried as far as anywhere, that of feeding live stock. Research workers have distinguished between a production and a maintenance ration, and have determined the proportions of various food elements in a "balanced ration" for an animal under various circumstances, such as doing heavy work or light work, or giving various amounts of milk per day, or fattening at a given rate, etc. But they have not worked out clearly the relation between input and output, and in particular they have not worked it out in such a way that the ration can be rebalanced in the economic sense as the prices of the various components in the ration change.

If producers do not generally have such information, how do they ever attain anything like a highest-profit combination? The answer is—mostly by the method of trial and error, and by following the lead of the apparently more successful. In spite of this lack of data about their enterprises, producers are usually keenly interested in them. They watch closely what is going on, learn what they can from their competitors, and arrive at definite conclusions as to ways of improving their own methods. Some of the changes which they institute apparently lower costs, or increase profits, and some do not. If changes result favorably, they adopt them for the future; if not, they go back to the old ways, or perhaps try something else. In case of favorable results, they may even go farther in the same direction; for example, if they found that increasing the potash in the fertilizer mixture one-half apparently increased the yield, they might decide to double it next time. Or if they found that adding an extra man to a machine

and increasing its speed apparently lowered costs, they might try adding another man and increasing the speed still more. Or if they found that advertising in a second magazine seemed to increase profits, they might advertise in still another.

This is the method of trial and error. Sometimes it is called the method of "experimentation." There are, however, two fundamental differences between this method and the method of experimentation. One is that experiments are likely to be conducted on a small scale with a view solely to developing certain information, whereas in the trial and error method, the real objective is a better return to the business that year from that particular operation. Only occasionally will an entrepreneur try out a new method unless he has concluded in advance that it will pay him better than the old method. The other difference is that in experimentation the conditions surrounding the trial are controlled and kept constant and uniform. This points to a fatal weakness of the trial and error method. The entrepreneur often does not really know whether the new method has reduced costs or not. Perhaps the weather was more favorable for potatoes during the second year. Perhaps labor was generally more efficient over the whole plant that year. Perhaps the growth in his business was largely a response to a good product and good service in years past; or because the new advertising medium was better than the old one.

There are several difficulties with the making of progress by following the example of the apparently successful. One is that the apparently successful have a way of going bankrupt unexpectedly. Another is that the successful ones may be doing some things wrong, and these may be the very ones that are imitated.

Eventually, however, the methods of trial and error, and following the examples of the most successful, would make cost quite or nearly uniform for all plants in one area, were it not for the dynamic influences, the stimuli to change, that constantly appear. Chief of these are the constantly changing prices of the cost elements. With prices of the elements constantly changing, producers cannot possibly keep up with them. It is not even wise to attempt to keep up with all such changes. Some of them are very temporary and a producer no sooner has readjusted for them than he needs to readjust back again. This is especially the case with production processes that last over a long period, or with

changes which require a considerable time to work themselves out. An extreme example of this is artificial forestry. Some important changes in organization and method can be made after a forest crop is started; but most of them must be determined at the start. All that the entrepreneur can do in a case like this is to forecast the prices of his cost elements—of his labor, equipment, land, supplies, etc.—over the whole world. With orchard crops, the problem is scarcely less difficult. The horse raisers of this country also have suffered severely at times from this same difficulty. Even in planning for one-season crops like cotton and corn, the farmer must forecast prices of his cost-elements at the beginning of the season. Manufacturing offers many similar examples of the same difficulty; leather manufacturing, previously mentioned; pork products; clothing; furniture, etc. The result of such a situation is that some producers plan in one way and some in another; and it afterwards turns out that one way was the better, and gave lower costs. But if the cost-rates responsible for the difference in costs could not have been foreseen, then the entrepreneur with the higher costs cannot be held accountable. The high and low costs in such cases are accidental. However, as pointed out in the chapter on Risk as a Factor in Production, there is increasingly less excuse for guessing in situations of this sort. It is becoming increasingly possible to forecast price changes with some assurance. Few of the forecasts are likely to be highly certain; but if they are right twice and wrong once, then those who make use of them will have lower costs over a period of years.

A special phase of this difficulty has to do with estimating such items as depreciation, repairs and renewals, maintenance and obsolescence, of buildings, equipment, workstock, land reconstructions and the like. Machines are ordinarily purchased outright, and the producer has to estimate all the foregoing items in advance before he can make an intelligent decision as to whether or not to purchase. The same is true of buildings. It is very easy to estimate wrongly, for very little accurate information is available with respect to many of these items. The manufacturers of machines are prone to underestimate depreciation and upkeep. Obsolescence is one of the most uncertain of all items. Those manufacturers who handle their affairs in such a way as to experience more than the ordinary amount of obsolescence on their plants and equipment, other things being the same, will have higher

costs than their competitors. This will apply especially to building sites.

After allowing fully for unforeseeable changes in cost-rates in the case of products with a long production period, and for reorganizations that cannot be remade quickly, there is still much variation in costs resulting merely because entrepreneurs either fail to recognize sufficiently the price changes that have already taken place, or more commonly, fail to readjust for them after they have recognized them. In some cases they do not appreciate that readjustments are necessary if their costs are not to rise relative to those of competitors; in other cases, they have formed consciously fixed notions that their way is the best way; in other cases, they have unconsciously, as a matter of habit or custom, accepted a given way as the correct way. This last is most likely to occur with enterprises of the sort that prevail in retailing, agriculture, and small manufacturing. In these fields, entrepreneurs are prone to follow a "rule of thumb" that someone has set forth for their guidance. In agriculture especially, this takes the form of a set of "unit requirements," or particular amounts of man-labor, horse-labor, etc., that should be used, presumably, regardless of price changes. The result of all the foregoing is a tendency of readjustments in combinations of cost-elements to lag behind cost-rate changes.

If all producers lagged the same amount, there would be no resulting increase in the variations in costs. But what happens is that some respond with their very next production act, some only after several years. Then there are some who respond, but respond too much, or too little. Those who respond at once and in the right amount keep as close to their highest-profit combination as before; those who do not respond at all drift farther away from it unless it happens to be coming in their direction; those who respond too much will likewise move farther away. The effect of a change in price of the cost-elements is therefore to string the producers out and increase the spread between highest and lowest costs. If cost-rates stopped changing for a while, the spread would decrease, and might eventually largely disappear. Changes in the price of the product will of course have the same sort of disturbing effect on combinations of cost-elements as changes in cost-rates. Under the stimulus of higher prices for their product, manufacturers will usually try to increase their output. Almost any

method of increasing output involves a change in proportion of the cost-elements, and hence of cost per unit of output. Different producers respond in different degrees to such a stimulus, because their margins of profit or volumes of business are different, or because of different conditions in their plants, or different degrees of desire for additional profits, or for any one of a dozen reasons. The result is a stringing out of the producers and widening of the range in costs. A decline in prices of the product will produce different sorts of changes in combinations of cost-elements; but will be equally effective in widening the range in costs. As a matter of fact, changes in prices of products occur more frequently, and are more violent, than changes in cost-rates; and hence are a more fruitful source of maladjustments.

Differences as to Production Elements Used.—The choosing of the amounts of the various production elements discussed in the preceding section often resolves itself into a question of whether or not to use any at all of certain factors. For example, such questions will arise as whether to perform a certain operation by hand or by machine, or whether to install a refrigerating machine or use natural ice, or whether to use horse-labor or a tractor. Different producers will choose different ways, and differing costs will result. The reasons for these different choices are much the same as those outlined for different choices of proportions of the elements. Many producers cannot tell which elements they should use. They do not have the necessary data for their own enterprise, nor for the elements in question. They do not know the relation of input to output for the labor that they might use, nor for the machine that they might use instead, so that they are unable to compute a least-cost combination for either. Hence they proceed by the method of trial and error, or following the example of their supposed betters. Proceeding along these lines, they lag in changing from labor to machine, or perhaps change in some cases when they should not, or change before the price of the machine has fallen to its proper level. In a period like the present with wages high, there should be a more general substitution of machinery for labor. Some manufacturers will postpone this too long and will find their competitors underselling them because of the lower costs they have attained by the use of machinery. Others will flee from their labor troubles to machinery too soon. One cause of errors of this sort, as already pointed out, is miscalcula-

tions of the depreciation, repairs and maintenance of machinery. Because of the high costs of these items, many producers have discarded their machines after a few years and gone back to hand labor. Also whether to install a machine or not depends in part upon the volume of business to be handled. Industry is full of small plants equipped with machines that require a higher volume of business for economical operation then they can expect to realize.

Differences as to Types of Production Elements.—In many cases the choice is not between more of one element or less, or between one element and another, but between types of production elements—between brick or concrete or frame construction; between a one-story or a two-story structure; between a hot-air or a hot-water heating system; between a steam hoist or an electric hoist; or between wooden-block or concrete or asphalt pavement; or between several breeds of cattle or swine. There are just as many chances for error in choices of this kind as in the two respects already discussed. The most important chances of error are in the matter of estimating depreciation, repairs and upkeep of different types of building or equipment; in the matter of estimating the inputs of other elements, such as labor, fuel, supplies; and in the matter of estimating obsolescence. This latter especially applies to buildings. Volume of business must be estimated, because it is this that frequently determines whether to figure on full use over a short period, or light use over a long period.

A question that is constantly arising in the field of production is whether or not to introduce some new type of machine or equipment in a particular plant. While producers lag considerably in adopting new equipment, there is also a tendency for something akin to "fads" to develop. Two or three large mines may put in electric tramways, and presently half the mines in the region have electric tramways; whereas, as a matter of fact, only a half a dozen of them are of such size, or have ore bodies so located, that it pays them to change. The effect of following such fads is to raise the costs of those producers who adopt new methods who should not do so. At the very time, however, that some are doing this, there are usually more who should adopt the new who do not. On the whole, there are probably more losses from lag in accepting new methods than from adopting them ill-advisedly.

Differences in Combination of Capacities.—The problem of combining amounts of the elements often takes the form of choos-

ing the proper capacity of the elements. It was pointed out in Chapter XIII that the objective in combining capacities was to obtain as good a " fit " as possible. Large or small capacity in and of itself is of no significance. The problem is merely that of getting the right capacities of the production elements together in a production process. The capacities of the various elements are properly fitted to each other when they are used at maximum economic efficiency. This is of course only an ideal, to be attained if possible. In most instances, a combination that gives maximum efficiency in the use of one element does not give it for the others. A further difficulty is that of adjusting the size or capacity of the production elements to volume of business. This problem often takes such forms as what size of machine to install, or whether to install two small ones or one large one, or what sizes of two or more small or large ones. As already pointed out in Chapter XIII, the choice will depend upon the prices of the input elements associated with the machine. At one set of cost-rates, it may pay to use the small machine; at another, the large machine.

It is not difficult, therefore, to find reasons for malcombinations of capacity of the elements. Before the capacity of any unit of a production element can be known, an input-output analysis needs to be made. Few producers make such analyses for plant, equipment and labor. Manufacturers of equipment frequently make analyses of various sorts, but they seldom put their results in such form that the users of the equipment can determine its capacity and efficiency. Most of their advertising literature is full of grossly exaggerated statements. A churn is rated at a certain number of horse power; but at what input will it use this much power to best advantage? or what outputs will result at other power inputs? Since machines must frequently be used at other than maximum efficiency, the users of them should know what results they give at lesser or greater inputs. Only the user of the machine can determine economic capacity, for only he knows what prices are at the time he proposes to use it.

The same problem presents itself in the choice of buildings, or laborers, or workstock, or productive live stock. These all occur over a wide range of capacities, and all have different capacities for each of the various input elements associated with them. Moreover, as with machines, their economic capacities vary with changing prices of the various elements associated in the production process.

It is very easy for producers to miscalculate as to their volume of business, and as a result find themselves subsequently using their plant and equipment at under or over capacity. If they over-estimate, the result is too high fixed costs per unit of product, and if they under-estimate, too high variable costs. One of the reasons for these wrong estimates is that an entrepreneur must plan for the future. He will normally expect his business to grow, but how can he know at what rate it will grow? In the first year after he had erected his plant, his costs are likely to be high. If his business gains as he expects, however, the losses from this cause will be more than made up later. Eventually, his plant may prove to be too small for his growing business, causing his costs to rise again, at which point he will probably enlarge his plant or rebuild. An enterprise which is steadily growing will therefore pass through successive cycles of high and low costs as business increases and the plant is enlarged. At any given time, therefore, some plants may be operating at under-capacity, some at capacity and some at over-capacity, with all stages between, and with costs in proportion. Of course, if costs are figured on a long-time basis, taking a period long enough to include use at capacity as well as under-or over-capacity, many of these differences will disappear; but there will still be differences due to how well different producers secure a fit over the whole period.

Volume of product also varies from season to season, and from year to year in the various phases of the business cycle. Looked at from a short-time point of view, these produce seasonal or yearly variations in unit costs. But in this case, there is little doubt that the period taken should be long enough in the one case to include all the seasons of the year, and in the second case, to include the whole business cycle. But even on this basis, there will be differences in costs arising from different degrees of seasonal or business cycle variations in different plants, or different degrees of adjustment to these variations. Other things being the same, a plant that turns out four times as much product in June as in December will have higher costs than one that turns out only twice as much.

A special form of the foregoing occurs in the case of enterprises which keep a stock of goods on hand or in process. In such cases, the entrepreneur must estimate in advance the rate at which his goods will sell, and the total amount he can sell. If he overstocks, his turnover will be low and his costs high. Book publishers are

especially in danger of mistakes of this kind. They may get out a large edition of a book and sell all of it in a month, or in ten years, or never. All merchants are subject to the same vicissitudes, although to a lesser degree.

Differences in Combinations of Efficiencies.—Equally important in causing variations in cost are malcombinations of grades of efficiency. Chapter XIII suggested that the combination of efficiencies that gives the most economical production is frequently the one which combines the same grades of efficiencies of the different elements, No. 1 land with No. 1 labor, No. 2 land with No. 2 labor, etc., the ranking in efficiency being upon the basis of economic efficiencies in the highest-profit combination. If any producer insists upon using No. 3 labor with No. 1 land, or vice versa, he may find his costs too high, even though he uses the right amounts of each, and secures a good fit in the matter of capacities. If he uses No. 3 labor and No. 1 land, he may find that the rents he has to pay for the land are higher than his product warrants; if he uses No. 1 labor on No. 3 land, he may find the wages higher than his product warrants.

Such being the case, there is a tendency for the same grades of efficiency to be associated with each other. It has frequently been noted that in general the better farmers are on the better land. If there is good land and poor land in the same territory, there is a constant shifting of the inefficient to the poor sections, and of the efficient in the other direction. Rural sociologists have cited numerous instances of such migration between adjoining hill and plains regions of various points along the Alleghenies. Oftentimes prosperous farmers on the fertile plain have unthrifty cousins or even brothers among the " hill-billies." There is the same sifting out of the inefficient from the fertile lands of the corn belt to the cut-over lands North and South, to the " abandoned " lands of the East or the semi-arid lands of the West, and to the cities. The cities in turn sift out their quota of inefficient as " back-to-the-landers," many of whom become settlers on the hitherto unoccupied lands of the cut-over or semiarid regions.

The usual statements made by farmers who have left the corn belt for poorer lands are that land is altogether too high there, that " nobody can pay going prices for it and make any money." Obviously a good many people are paying such prices and still making money or the prices would not continue so high. What

these farmers really should say is that *they* cannot pay such prices for it and make money.

The process works out very clearly at an auction where, let us say, dairy cows are being sold. Let us assume that one of the best cows is under the hammer. As the bidding goes on, one after another of the bidders drops out, saying to himself that "the cow isn't worth the money." Yet the chances are very good that the efficient farmer who finally secures her will make a good return on his purchase.

Salesmen who travel among retailers will testify that the same process is operating in the merchandising field, that the goods which they sell freely to efficient merchants, upon which these merchants make their largest returns, cannot be sold to the inefficient merchants.

In the field of manufacturing, the most efficient employers usually secure the better workmen, pay the highest wages, and make the largest profits.

When an improved machine is put upon the market, it is usually the efficient that buy at first. The price at which it sells at first is probably so high that only the efficient can see a profit in using it.

But after all, such a process is largely a matter of trial and error. It is largely only because the efficient have tried their hand with efficient land or equipment that they know that it pays to use them even at prevailing prices. For every one who tries and finds that it pays, there may be another who has tried and found that it did not pay. And every trial of this kind represents a loss. At the other end are efficient producers gradually trying out better equipment and slowly discovering the right combination. There is loss in this too.

Moreover, there are some who so lack initiative that they never try using the more efficient elements of production. They might find themselves very efficient in handling efficient men or machinery if they only were venturesome enough to try it. Such individuals are at the other extreme from those who are over-venturesome and overconfident of their own powers and are constantly overreaching.

A special reason for misfits—and this applies to capacity as well as to efficiency—is that young men acquire enterprises from their fathers which require either more or less capacity or efficiency than they possess. If the enterprise is beyond them, they will

find themselves running behind a little more each year, and finally sell out to escape bankruptcy; or they may hang on till a business depression hits them and forces them out; or their volume of business may fall off to the point where it is within their powers. In agriculture, they will frequently hang on by lowering their standard of living.

If the business inherited requires less capacity and efficiency than the young man possesses, he will frequently be able to increase the volume of business, or reorganize the plant and equipment upon more efficient lines; or if these are not possible, to sell out and buy another more suited to his abilities.

But obviously all this takes time and is wasteful. Moreover, a large number of them never get properly adjusted. The result is that at any given time, a large percentage of the producers in any field are improperly fitted as to capacities and efficiencies. That this is true is at least suggested by whatever studies have been made bearing at all on this point. In agriculture and retailing, which are about the only fields in which such studies have been made, the studies of the relation between size of business and incomes, after making due allowance for the poor measures used for both size of businesses and income, indicate conclusively that this is the situation. In Figure LXXII, which is a generalized presentation of the sort of results which are characteristically obtained, the line AB shows the general tendency of incomes to increase with size of business. But there is no very close relation between them. In the larger sizes are some very small incomes and some very large ones, and likewise in most of the other sized groups. At the bottom are no large incomes—it is not possible under ordinary circumstances for one to be efficient enough to make a large absolute income from a very small business. The percentage return may be large, but not the absolute return. On the other hand, one can be inefficient enough to realize only a small income from a large business. This accounts for the low incomes that occur farther up. The incomes to the right of the line probably represent good fits as to capacity, or relatively high efficiency, or good combinations of efficiency, or more or less of all three; those to the left, the opposite of these conditions. Differences in efficiency alone could of course account for all of the variations in income for any size group, but it is more reasonable to assume several causes operating than one. In this case, we may suppose that

any departure from the line AB may be due in considerable part to differences in combinations of capacity, or of efficiency, or of both—departure to the right indicating good combinations, departure to the left indicating bad combinations; and the line AB itself representing average combinations.

Other reasons for misfits of capacity and efficiency closely related to the foregoing are the lack of training and education or of capital which handicap some really able persons, especially in

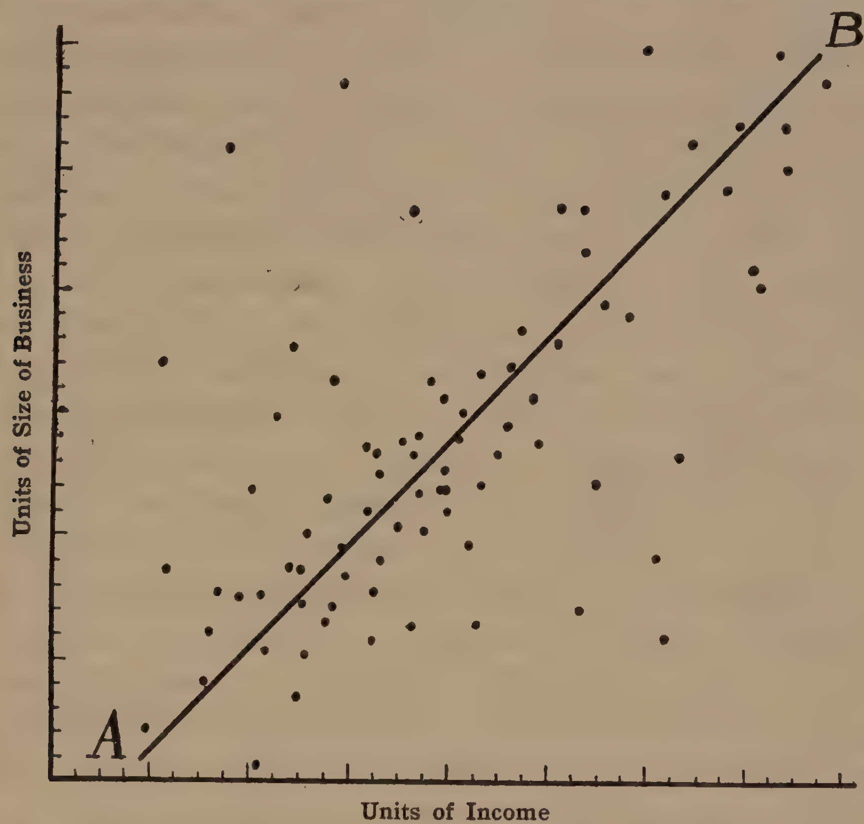


FIG. LXXII. Variations in Incomes with Size of Business.

their early years; and the plenitude of these which starts others out too well in their youth, with the result that they may have to give way to others later.

Finally, it must be remembered that capacity and efficiency are not fixed for any individual, and many will be able to grow into jobs beyond their reach at first.

Differences in Size of Business.—No matter how well a business is organized, or how well its plant, equipment and labor are matched as to capacity and efficiency, it may have costs either somewhat high or somewhat low merely because it is small or large. A grocery store, for example, will have relatively high

costs, no matter how efficiently organized otherwise, if it is located at a point where volume of business is bound to be small; and relatively low costs, unless very poorly organized otherwise, if it handles a large volume of business. Variations in costs due solely to differences in volume of business are probably not as great as many suppose. Much of the wide range of differences usually discovered is due to the omission of certain concealed costs, to differences in quality of the product, or errors in the data. This is particularly true of merchandising establishments. The true variations in costs due to volume of business arise mostly from variations in the proportions of fixed and variable expenses. A small business is likely to have relatively high fixed expenses. A plant for manufacturing 50 automobiles a day is not twice as expensive as one for manufacturing 25 automobiles a day, and does not have twice the equipment, or twice the office force, or twice the pay roll for officers and managers. The entrepreneur of a small business concentrates his management upon a small volume and keeps unit costs low. Much of the remaining variation in costs with volume of business is due to rather incidental causes, such as the difficulty of securing a good fit of capacities of equipment and men in a small business, or wasteful use of supplies, or inability to utilize by-products, or buying in small lots, as pointed out in the chapter on Size of the Business Unit.

It is hardly proper to consider differences in costs due to mere differences in volume of business as an effect of maladjustment. It is only when volume of business is smaller or larger than a given situation warrants that maladjustment can be said to exist. There can be no doubt that enterprises answering this description occur in great abundance. We surely have more small retail stores, banks and farms than good economics can justify.

Type of Business Unit.—The type of business unit of itself has no effect upon costs. Only malcombinations of type of business and type of business unit affect costs. The shifting from one-man units to partnerships to corporations, or vice versa, that is constantly under way must surely be accompanied by a large number of maladjustments. Shifting from a one-man unit to a partnership frequently runs costs up because the step is taken prematurely and the business finds itself oversupplied with salaried management. Young corporations frequently find themselves oversupplied with paid officers. On the other hand, many one-

man businesses long ago reached the point where an expansion of the responsible management at the top would increase the efficiency of the organization.

The plan of financial organization affects costs principally through its relation to the supply of capital obtained and the terms upon which it is obtained.

Plan of Business Organization.—The costs of management per unit of output vary greatly between large business enterprises. It is commonly said that management costs per unit of output increase after a certain point as size of business increases; and in some cases, that they increase more rapidly than other costs decrease. Whether this is true or not depends upon the size of the managerial staff in relation to the size of the business and upon the plan of its organization. In general, other costs decrease as management costs are increased. This is because more attention is given to details of the business, better records are kept, and more wastes are eliminated. But the saving in other costs may be more than offset by the increase in management costs. For any one plant, there is a least-cost combination of these two costs. The functional plan of organization is usually most effective in reducing other costs, because it represents a higher degree of specialization and skill in management. But a business needs to attain a certain size before it can support a corps of specialists with skill enough to accomplish any worth-while savings in other costs. Many small manufacturing plants have no doubt carried specialization in management too far and have raised their costs in consequence. It is usually possible to functionalize a plant by degrees. Each step in functionalization can then be considered by itself to see whether it will reduce labor and other costs more than it will raise management costs.

A few years ago, one would surely have said that more business enterprises in the United States were undersupplied than oversupplied with managers. But management has been almost a fad in recent years, and the result may be a very large number of overstaffed small and medium-sized establishments.

Differences in Managers.—The way in which differences in capacity of managers affect costs has already been explained. A manager with large capacity will find himself making the largest total profits with somewhat low per-unit profits, and hence high costs per unit of output, and will make up the differences in the

volume of his output; whereas a manager with small capacity will find his costs rising rapidly as his business expands, and hence will try to build up his income by keeping his costs low. Many of the foregoing reasons for the variations in cost are very closely identified with the efficiency of the management. Costs will vary from plant to plant with the efficiency of the management. The manager with highest efficiency in the use of labor, equipment and the other cost-elements will have the lowest input of these per unit of output, and hence the lowest costs. When these differences in efficiency of management are analyzed, they will be found to consist in part of differences in knowledge and understanding of least-cost and highest-profit combinations, combinations of capacities and efficiencies, changes in cost-rates and prices of products and their effect on cost and profit combinations; and in disposition and ability to readjust businesses to changes of all kinds. But they also consist in part of such things as ability to plan work, supervise men, and keep details in mind, which are not included in any of the above descriptions of reasons for variations in costs.

Differences in Technical Practices.—There are a large number of technical practices involved in production which have important effects on costs. One producer keeps his refrigerator room temperature at 20° F., another at 25° F.; one pre-cools before shipment, the other does not; one makes his by-product into citric acid, another into a beverage; one cures his alfalfa under hay-caps, the other not; one has his drilling done on a piece-rate basis, the other on a day-rate basis. All of these can be included in one way or another under such heads as proportions of the elements, differences in capacity and efficiency, etc.; but it is much simpler to consider them as causes by themselves. Business men are inclined to account for almost all differences in costs in this way.

Maladjustments in Prices and Cost-Rates.—Until prices of products and cost-rates are properly adjusted to economic conditions, it is useless to expect production to be so adjusted. We have learned that the markets for many products are so poorly organized that prices in them respond rather slowly to changes in supply and demand, and that this is even more true in such markets as the labor and the real estate markets. What is more, the markets for production-elements reflect only roughly the differences in the productivity of units of the producing elements. The

result of this is that it is easily possible to obtain production-elements for less than they are worth, and to sell one's product for more or less than it is worth, according to prevailing levels of values. The effect of either of these is to produce variation in costs.

2. Of Maladjustments between Establishments in the Same Area with Different Combinations of Products

The foregoing analysis assumed plants turning out only one product. We know that so far as numbers go, more plants have more than one product than have just one. All stores, most farms, and probably even a majority of factories have more than one product. Variation in the proportion of these different products handled is one of the major causes of variations in costs. Let us take as a simple case the milk distributing business. Some milk distributors handle only milk and cream, some buttermilk in addition, some cottage cheese, some butter, some eggs, some ice cream. As between distributors handling the same list of products, the proportions of each change. A more complicated case is that of farming. Different farms in the Red River Valley of Minnesota may produce any combination or set of proportions of the following: wheat, potatoes, hay, corn, oats, barley, rye, flax, sugar beets, swine, beef cattle, dairy cattle. It is obvious that in such a case there will be variations in costs between the different establishments for each of the several products produced in combination. A hundred farms in an area producing hogs, milk and eggs for the market might have hog costs ranging from \$7 to \$12 per hundredweight, milk costs ranging from \$1.10 to \$2.30 per hundredweight, and egg costs ranging from \$.14 to \$.30 per dozen. These variations may arise from any or all of the causes discussed in the last section, and in addition merely from the fact that the different farms combine hogs, milk and eggs in different proportions. It is the purpose of this section to discuss especially this latter cause of variations.

It will be remembered from previous discussion that if the different enterprises on a given farm or in a store or factory are properly adjusted to each other, they will all be equally profitable. For reasons much the same as given in the preceding section, they are seldom so adjusted. It is difficult for producers to know what combination of enterprises gives them the largest net income. One year's trial does not reveal very much because conditions

are likely to be more or less peculiar any one year. This is especially true in agriculture. Under such circumstances, some guess one way and some another, and this produces difference in combinations of enterprises and resulting incomes. Even if producers could find out the best combination, they would be slow about adopting it. The change in prices of the different products, and in cost-rates of the production-elements, that are constantly occurring, require changes in the combination of enterprises. The uncertainty as to how long the price changes will continue keeps many from changing when they should. Habit, custom and fixed investments have their influence also. Some producers lag a great deal in changing combinations to suit changing conditions; some follow fads and rush into new supplementary and complementary enterprises just because their competitors are doing it. To whatever these variations may be due, and more especially if they are due to the latter sort of causes, they cause wide variations between individual producing units in the costs of each of the products. The costs of handling milk vary from distributor to distributor according to the number of other lines handled on the side, and the proportions between them; and so for the costs of each of the several supplementary lines.

Not all the variations between different establishments in costs of the different products are, however, to be attributed to maladjustments. Many of the differences in combinations and proportions are explained by differences in situations. For example, one milk distributor may be handling a small volume of milk in a selected area, another may be covering the whole city; one may have an outlet for its by-products and another not; one may be selling to people with high incomes who buy considerable cream, leaving them considerable skim milk to dispose of as cottage cheese, etc. Differences in soil, topography, labor supply, capital supply, distance from town and the like, may account for much of the variation between farms. A farmer with a large amount of family labor available does not have his enterprises properly balanced unless he has a larger proportion than usual of enterprises using family labor.

Much of the variation in costs shown by such studies as have been made of producing units with several products, are due to errors in the cost data. Chapter IX pointed out the great difficulties of allocating costs to different products in a combination.

Proper valuation of the cost-elements would eliminate many of the apparent differences in costs between establishments. This is especially true when differences in combinations are due to differences in situations. Family labor used by a supplementary enterprise on farms where it is abundant should be charged at a lower rate than upon farms where it is scarce. If this is done, the cost of production of the supplementary product may be the same on the two farms. The same analysis should apply to land used in a supplementary relationship in a crop rotation.

3. Of Maladjustments between Establishments in the Same Area with Entirely Different Products

While it is not possible to compare directly the costs of two plants turning out entirely different products, nevertheless the costs of the two plants can each be compared with those of similar plants in other areas, and thus given an index or ranking. On this basis, it can be said that a steel plant in a certain city has costs much above the average for all steel plants, and a clothing factory much below the average for all clothing factories. All producers of milk in a certain area may have relatively high costs, and all producers of hay relatively low costs. Some of these differences are due to entirely unavoidable causes. Milk is a perishable product and must be produced rather near to the place of consumption. Hence it will continue to be produced in the New England states even though its costs are high. Gas costs are unavoidably high in cities far removed from coal mines. But some of the differences in cost levels for different products in the same area are easily avoidable, being the result of maladjustments in location of enterprises. This may arise either from starting new enterprises in the wrong location, or from continuing enterprises in a location after economic conditions have changed. Every new plant of any kind started in a place when it only halfway succeeds has relatively high costs. Some of the cotton mills in New England are apparently finding their costs too high in comparison with costs in Southern cotton mills.

4. Of Maladjustments between Areas Turning out the Same Product or Products

Studies of costs in different sections of the country, such as might be made of coal production in Pennsylvania, Colorado and Illinois,

or of wheat production in West Virginia, Indiana, Kansas and Washington, frequently appear to show large differences in costs. The figures reported for such studies are given in the form of averages for the areas. The first reason for the differences in costs obtained is of course errors in the method *which do not affect all*

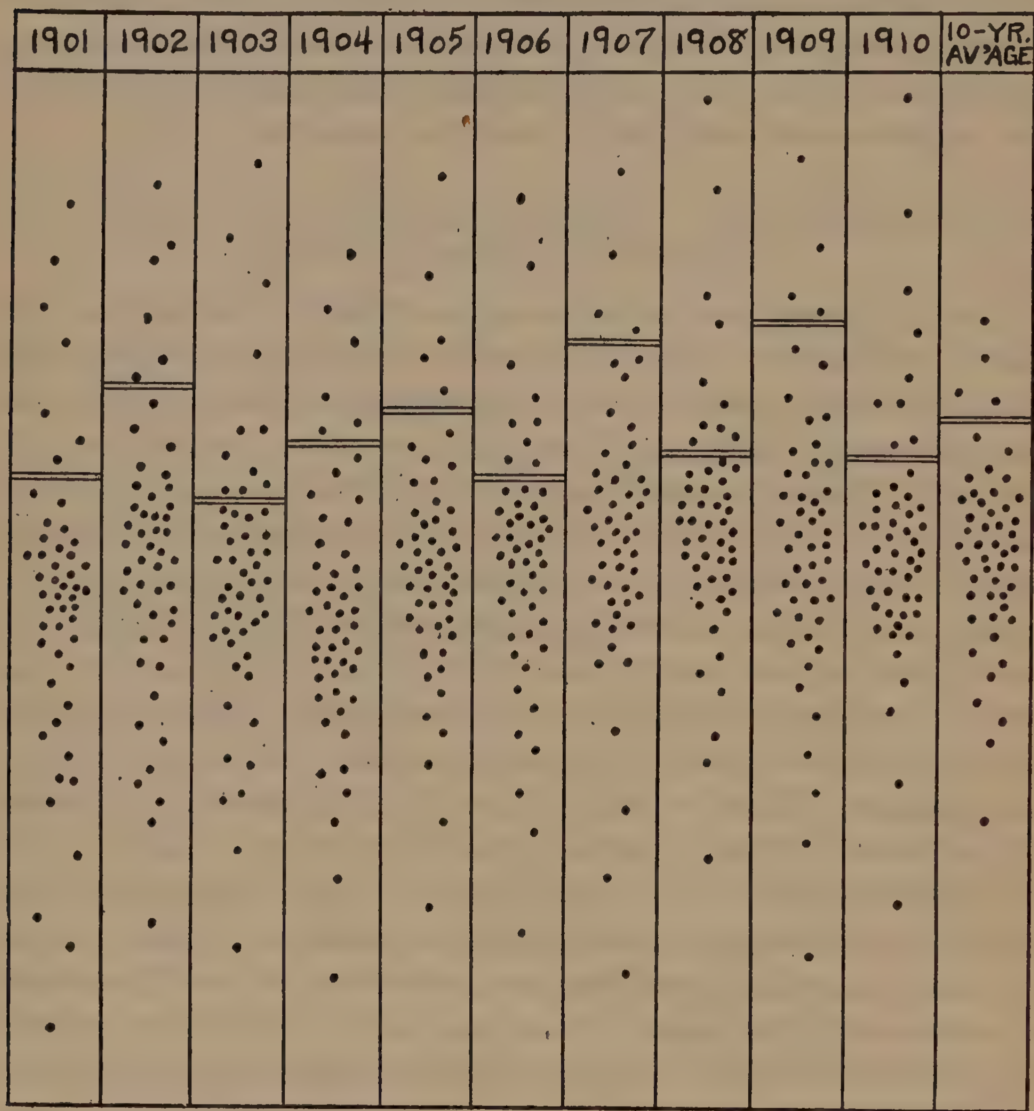


FIG. LXXIII. Hypothetical Illustration of Range in Costs of Agricultural Products by Years, and as a Ten-Year Average.[1]

areas alike. Thus a wrong method of allocating rent costs to different crops in a rotation will produce different degrees of error for each system of rotation. It may make rent costs for wheat too high in West Virginia and too low in Washington. Secondly, the results of cost analysis always reflect the judgments of the persons

[1] Based in part upon actual data for several products combined. ═ = Selling price for the year.

making the studies in the different areas. In many cases, the agencies making the studies do not even follow the same methods—obviously such results are hardly comparable at all.

Many of these studies are made only once and for a single year. In the case of agriculture especially, the results usually reflect highly special conditions prevailing in that year. Yields of wheat may be high in Washington and low in Kansas in the year of the survey. Coal mining costs in Pennsylvania may be especially high because of a strike in the region. Figure LXXIII illustrates the effect of averaging crop costs over a 10-year period. A 20-year period would reduce the range still more, and a 50-year period still more.

After allowing fully for the foregoing, there still remain ample reasons for differences in costs between regions. Some of these reasons reflect maladjustments and others not. Of those which do not, difference in transportation and marketing costs is the most important. Taking wheat as an example, the ultimate outlet for all surplus wheat production is Europe. The farther from Europe that any region is located, the lower the price of its wheat at home, and, other things being the same, the lower its cost of production. Rents of land have to be enough lower in such a region to permit growing wheat at a profit or the wheat will not be grown. Transportation costs from Hagerstown, Maryland, to Liverpool via New York were 31 cents per bushel in 1924 ($.24 + $.07); from Colfax, Washington, to Liverpool via Seattle, 45 cents ($.24 + $.21); and from Hutchinson, Kansas, to Liverpool via New Oreleans, 57 cents ($.46 + $.11).[1] Costs of marketing have exactly the same effect as costs of transportation. Costs of production do not include wages of management of entrepreneurs. If returns to management average higher in one region than in another over a period, then this may be a factor in differences in costs of production between regions. Other things being the same, the higher the returns that management must receive in order to engage in a given line of production, the lower that costs must be. Other things being the same, in a small enterprise management is concentrated upon a small output, with relatively low costs per unit of output. Regions with small farms will therefore tend to have lower costs. This may, however, be more than overcome by the low efficiency and capacity of the management.

[1] *Yearbook U. S. Department of Agriculture*, 1924, pp. 1158 and 1163.

Of the reasons for differences in cost that can properly be said to reflect maladjustments, the most important are the following:

One area may be turning out a product at which it does not have comparative advantage. It may once have had such advantage, but economic conditions have changed. Competing products in this area now pay higher wages and rents than this product can stand. One area may be producing the product in a poor combination with other products. Either it should have no place in the combination at all, or should have a larger or smaller place in it. On its present scale, it may be conflicting for the use of labor with another product whose price has recently been much higher. The high costs from this source usually arise because a majority of the establishments in the area have malcombinations of enterprises; but they may arise because areas taken as a whole have the wrong combination of enterprises. Any community which supports establishments for manufacturing supplies which can be bought more cheaply elsewhere, will have higher costs of production for its other products as a consequence.

Cost-rates may not have risen or fallen as rapidly in one area as in another. Both wages and rents are inclined to lag a good deal. The land upon which wheat is grown in West Virginia may be rented for a dollar or two more or less per acre than wheat land in Kansas producing the same net income per acre. Wages persist in being lower in some states than in others; but such differences reflect differences in productivity mostly and have no effect on differences in costs. Low wages in our South do not of themselves enable the manufacturers in this region to produce more cheaply than manufacturers in our North. If for any reason, however, wages should rise or fall in both the North and South because of a change in the price of the product, and they rise in one region only, or in one more rapidly than in the other, then differences in the cost of production will appear.

If one region makes progress more rapidly than another, by improving its technical methods, by adopting better forms of business organization, or better methods of handling risks, the chances are that wages, rents and other cost-rates will not rise at once, and that for the time being costs per unit of output will be relatively low in the region.

5. Maladjustments between Countries Turning out the Same Product or Products

The analysis for this case is much the same as for the foregoing except that the differences are likely to be greater. Transportation and marketing costs are likely to show greater differences. There are much greater differences in the size of establishments, especially agricultural establishments. Wages and rents rise and fall more slowly in the old countries of Europe than in newer countries like the United States, Canada and Australia. This is especially true in comparisons between the rural districts of old and new countries. After wages and rents have changed, producers in old countries change their combinations of cost-elements more slowly than in new countries. Changes in prices of products are followed more slowly by changes in combinations of products.

There are also a few special circumstances which enter into comparisons of costs between countries. One of these is tariffs. Many tariffs have no effect whatever on production and costs. Most of them raise the price of the product in the country levying the tariffs because they cause the product to be produced under less favorable circumstances; also simply because they raise the prices of the product in question, and this presently raises rents and wages.[1] They lower it a little in the exporting countries for opposite reasons. The reason that they do not lower costs greatly in the exporting regions is that producers can usually shift to other products at small reduction in income.

An important special circumstance since the World War, is changing rates of exchange. A number of the countries of Europe do not have their currency upon a gold basis. Their paper currency in consequence is depreciated with respect to gold. At present writing (June, 1926) it takes seven times as many French francs to equal a United States dollar as before the War. All the while that French francs have been depreciating, wages, rents and other cost-rates have been reckoned in terms of depreciated currency. Wages and rents have never risen as rapidly as the francs have declined in value. In consequence, French producers have really had relatively low costs. Cost of production in England, on the contrary, have been high for some time because British money has been slowly appreciating.

[1] *Rents and wages understood as measured in money and sometimes even when measured in purchasing power.*

When costs are considered from an international viewpoint, they must be thought of as including more than the costs of production of particular types of establishments. The cost of producing United States copper as compared with costs of producing Chilean or Spanish copper depends upon the whole organization involved in laying down copper upon the European market—the mining organization, the smelting and refining organization, the transportation organization, etc. Any disjointedness anywhere in this whole structure will enter into the final costs.

II. EFFECTS ON PROFITS

Profits, as the term is used in this textbook, are simply the difference between expenses and receipts, or expressed on a unit basis, the difference between cost and selling price per unit times the number of units sold. They may be either positive or negative. If negative, they are called losses. Obviously they are affected by any change in cost-rates, or any change in prices of the product, or any change in the volume of output. They will vary from establishment to establishment, area to area, and country to country, as costs or prices of the product or output vary.

Variations in profits between establishments in any one area turning out the same product are more largely due to variations in costs than to variations in prices, since prices tend to be the same for all parts of the area. What variations in prices there are arise from differences in location within the area, from differences in skill in selling the product, and from differences in the quality of the product, which may not really be a difference in price at all. The reasons for variations in costs have already been presented. Variations in volume of business are due to differences in the capacities of the entrepreneurs and in their ability to make sales, and to local differences in market outlets.

Variations between establishments in their combination of products are a very fruitful source of variations in profits. The margins between costs and selling prices, assuming that the costs can be determined, vary for the different products. Hence a different proportion of these products causes a difference in profits. This would be true even if varying the proportions of the products did not affect the costs of the different products. In terms of analysis by the method of substitution, adding or subtracting different supplementary, complementary, or by-product enter-

prises, or different amounts of any of these, affects profits differently because it adds different amounts to, or takes different amounts away from, the expenses and receipts of the whole business. The constant fluctuations in prices of different products, especially of farm products, are constantly making different proportions of products the most profitable. One combination of products may be most profitable this year and another next year. Under such circumstances, producers find it hard to decide which is likely to prove most profitable over a period.

It is the usual condition for the different lines of production in an area to be unequally profitable. In this case, it is differences in the level of prices for the different products that is the most important reason for differences in profits. Since prices of the different products are ever on the move upward or downward, profits for the different lines of production are ever changing. There is a tendency for cost-rates to be the same for all enterprises in an area, since all are competing for much the same labor, land and capital. Differences in relative costs arise in such cases because of differences in the utilization of the cost-elements. Relative profits of the different lines any one year will be due largely to the relative prices prevailing that year, or relative volumes of output. Relative profits over a period will indicate degrees of adaptation to the location. New and rapidly growing industries, such as radio equipment manufacturing a few years ago, always have relatively high prices at the start, and hence are highly profitable no matter where located. After a few years, prices begin to decline and eventually some of the plants not well located have to go out of business. In a declining industry, profits are usually low and often negative, because competing industries keep wages and other cost-rates up to somewhere near their usual level while prices are falling for their product.

III. EFFECTS ON OUTPUTS

The effect of the foregoing maladjustments upon outputs are sufficiently apparent without much further discussion. Any misfit between areas and products means a reduction in the total output. The amount that the product is increased by specializing according to the principal of comparative advantage was fully explained in Chapter V. The relative prices of the competing products in the different countries determines advantage for each country in

such a way as to satisfy the wants of the world for the various products. If one region or country produces a given commodity at comparative disadvantage, competing countries must produce less of it in consequence and more of other commodities. This means that all of them are turning out less product than they should. Misfits between individuals and their occupations or tasks work out in exactly the same way.

If any establishment or city or region produces a wrong combination of products, the effect is to reduce the total output because not all the elements of production are as fully utilized as should be, or conflicts between enterprises reduce the output of the products having comparative advantage. The relative prices of the various products grown in combinations reflect the world's wants for each of them. If any producing unit turns out a larger proportion of a given product than it should, some others must produce less. Since only a few enterprises are in exactly the right combination, and departures in either direction from it reduce the economic output, the average output is always less than it might be.

Chapter XII pointed out that only when production in each establishment is at the highest-profit combination is society getting the fullest utilization of the elements of production. Given a certain fixed element, such as land, a larger total product can be obtained from it by going clear to the point of diminishing total outputs; but not a larger output from the land and several inputs combined. The price of the product and the cost-rates of the elements of production reflect the world's wants for the various products and world supplies of the various cost-elements. At the highest-profit combination, all these influences are combined in such a way as to secure maximum economic utilization of the elements of production. Since departures on either side of the highest-profit point reduce the economic output, the average output is always less than it might be; and the worse the maladjustment the lower the average.

Chapter XIII showed that misfits in combinations of capacities and efficiencies have the same effect on output as misfits in proportions of the elements. Maximum economic output is obtained only when capacities and efficiencies of the cost-elements are fitted to each other. This statement also covers the case of all misfits between individuals and their occupations or tasks.

The effect on outputs of mistakes in size of the business unit

are nearly all included in the foregoing. The same amounts of the elements of production combined into units of the proper size will give a larger total economic output than if they are partly combined into units larger and smaller than these. One of the most important factors in this is the combination of capacity of entrepreneurs and capacity of the business for management. If wages of management are low, smaller business units will give maximum economic output from the full productive equipment of society, in this case including entrepreneurship. The prevailing wages of management reflect world supplies of entrepreneurship and world needs for it.

Needless to state, type of business unit and form of financial and business organization have their effect on outputs; likewise methods of handling risks, and technical methods and practices of all kinds.

There remain to mention the effects on output of improper coördination of the various stages in production and of the various agencies employed in the marketing or exchange process, including financial, transportation, storage, and communication agencies. If any one of these is performing certain functions that are most economically performed by another, the effect is a reduction in the total output. If any of them is not keeping its rate of production in line with that of the agencies which come before or after it in the production process, the result is wasteful employment of the elements of production, and hence reduction in output.

Lastly, attention must be called to the effect of an imperfectly functioning market upon all the foregoing. Production cannot reorganize to meet changing prices and cost-rates until prices and cost-rates change. The more laggard that the market itself is in reflecting change in economic conditions, the more laggard production must be in passing into the right combinations. Also if the market fails to register properly the differences in capacity and efficiency of producing units, then production will fail to adjust for them. In the aggregate, the deficiencies of the market are responsible for a large part of economic maladjustment and loss of output.

SUGGESTIONS FOR FURTHER READING

For additional discussion of the subjects included in this chapter the reader is referred to Frank Knight's *Risk, Uncertainty and Profit* (1921), Chapters V, and Chapters VIII to XI. J. M. Clark's *Economics of Over-*

head Costs (1923), contains a theoretical treatment of the subject of costs. Chapters III to VIII and Chapter XIX will be found of most value in connection with the subject matter of this chapter. H. C. Taylor's *Outlines of Agricultural Economics* (1925), pp. 50 ff., gives a brief discussion of adjustment of enterprises to changing costs. F. M. Taylor's *Principles of Economics* (1922), Chapter XI, deals with effect on cost of an increasing output.

PROBLEMS

1. Why would maladjustments disappear in a static state?
2. Why do the producing units tend to fall into a similar distribution in different industries, a few with very low costs, a few with high costs, and a majority with costs between, as in Tables XLIX to LIII?
3. Arrange the causes affecting costs between establishments in the same area and turning out the same product in the order of their importance, and give reasons for your arrangement.
4. Explain by the use of the principle of diminishing output how variations in proportions of the elements used in production cause variations in costs.
5. Give examples of adjustments by the trial and error method and by the experimental method. How is the experimental method used for small enterprises?
6. Why do combinations of different grades of the elements cause variations in costs?
7. Many business men subscribe for all published business barometers. How can they make use of them?
8. When are business men likely to be most keenly interested in arriving at the best combination, during a period of prosperity or a period of depression? Why?
9. Under what conditions would it be wise for a firm to operate rather than close down during a period of depression even though it would have to sell each unit of product at a loss?
10. If all of the dots in Figure LXX fell on the diagonal line, what conclusions could you draw about relation of income to size of business?
11. Why do costs per unit of output increase as volume of business declines? If this decline in output is due to declining demand due to temporary conditions, such as the season, strikes, business depressions, etc., is it proper to say that costs per unit of output have increased? Explain.
12. Are there any differences in costs that are not due to maladjustments?
13. Explain by the use of the principle of comparative advantage how various combinations of enterprise cause variations in costs.
14. Explain how mobility of labor is a factor affecting variations in costs within a country and between countries.
15. Are profits due to maladjustments or to good adjustments or both?
16. If a survey showed that all plants in an industry were producing at approximately the same cost, could you conclude that there were no malcombinations?

17. Enumerate and explain some ways in which statute laws and man-made institutions other than the tariff affect costs.
18. Enumerate some of the readjustments in business that can be made from year to year as prices and other conditions change; and others which can be made only when the business is largely reorganized.
19. Why is quality of product an important factor, and the hardest one to deal with, in production analysis?
20. If you were to start in some kind of business, would you pattern your establishment exactly after a very successful enterprise of the same kind? If not, what else would you like to know?

CHAPTER XXIX

THE CONTROL OF MALADJUSTMENTS

Society is interested in securing as large an output as possible per unit of the human and natural resources engaged in production. The preceding chapter makes it clear that every maladjustment reduces this output. Eliminating economic maladjustments so far as possible is therefore the foremost of all socio-economic problems. This chapter will undertake to analyze this problem very briefly.

I. METHODS

The first line of attack upon this problem that occurs to one is to endeavor to make society *more static*. If all the dynamic influences could be eliminated, there would soon be no more maladjustments. No doubt some of the dynamic influences can be restrained considerably. The severities of the business cycle probably have already been reduced somewhat, and it is the confident expectation of all workers in this field that they will be reduced still more in the future. The extremes of the last inflation and depression were mostly if not altogether a war phenomenon. The last severe depression previous to this was in 1893. It seems reasonable to suppose that the upward and downward swings of production cycles can also be reduced in large part.

The procedure which is usually outlined for attaining these ends is to set up machinery for collecting and disseminating current information as to the changes taking place. If producers of apples knew at any one time where they were in a production cycle, they could, if they only would, lay out courses of action for themselves that would check further developments in the wrong direction. If they knew how many trees were planted each year, and could see that the trend was too rapidly upward or downward, they could adjust their own plantings accordingly. If business men knew that business was expanding at too rapid a rate, they could adopt more conservative policies for a while. Bankers are in an especially favorable position to exert such an influence because of their

power over credit extension. The Federal Reserve System is at present endeavoring to follow out a program of this kind.

An extension of the foregoing procedure is the forecasting of future developments. As was pointed out in the chapter on risk, any happening of the future is a disturbing influence largely to the extent that it is unpredictable or non-insurable. Regular changes, such as of the seasons, are all provided for in advance. The constantly improving organization of society for keeping records of economic changes and analyzing these so as to obtain bases of forecasts from them, is making many types of changes far less unpredictable. Insurance organization is improving even more rapidly.

Society is also setting up more controls of the type that will prevent such disturbing influences as disease epidemics, famines, and even wars. It is probable that population pressure will cause less disturbance and insecurity in the future. Also as the world grows older, there will be fewer differences between different parts of the earth. Fewer new areas will be opened up to exploitation.

But in spite of the most that can ever be accomplished, society will still be dynamic. Varying weather will still produce its varying crop yields, and prices will continue to rise and fall. In the calculable future, society will be very dynamic. The other line of attack on the problem of reducing maladjustments is therefore to assume that disturbing influences will continue, and endeavor to make society *more fluid* so that it will adjust for them quickly when they come. There is, as a matter of fact, very little difference between a society which is completely static and one which is completely fluid. Professor J. B. Clark has even described a static society as one which is completely fluid. His concept of static is "perfect fluidity, but no motion." If any disturbance were to occur in such a state, everything would immediately adjust to it and complete calm would instantaneously prevail again. While such a state can never come to exist, no doubt developments can be made in that direction.

The first step in that direction is improving our marketing system so that prices will more quickly and more accurately reflect changes in economic conditions. This is necessary not only for the commodities market, but for the labor, real estate and loan and securities markets as well. After market prices are made more fluid, then people must be made to readjust their activities

to them more quickly. This requires two things always, namely, getting the information of price changes to them, and getting them to react to it. This latter frequently involves teaching them how to react to it, and supplying them with other additional information needed.

The foregoing may be illustrated by the following case: Let us assume that the flax growers of Argentina plant an abnormally large acreage of flax in a certain year, and that as the season advances the yield promises to be large, and that finally the threshing proves that there is a larger volume of production. A properly organized market would have really accurate information as to acreage planted, as to condition of the crop at each state, and as to the final production. It has none of these at present. The market prices from day to day reflect views of all these conditions, but the news is without proper foundation, and much of it contradictory. The market prices properly reflecting these conditions in Argentina should at once reach every owner of any flaxseed in the world, every flaxseed crusher, every considerable user of linseed oil and oil cake, and every prospective grower of flaxseed in the northern hemisphere. Buyers and sellers of flaxseed should at once adjust their plans to them; likewise producers and consumers. Before they can do this, however, they need to know what effect these changes should make in their plans. The flax growers should be able to figure out how a decline in the price of flax from $2.20 to $1.50 a bushel should affect their combination of enterprises; the Danish farmers how a fall of 50 cents a hundredweight in the price of oil cake should affect their dairy cattle rations, and the paint manufacturers how much the cost of their paint will be decreased. The home owners should know how much it will reduce the cost of having their houses painted.

Command of all the information needed to figure least-cost and highest-profit combinations of the elements of production, and the most profitable combination of enterprises, is therefore an absolutely necessary part of a program of making economic society more fluid. No less important is instruction in making proper use of such information. It is just as serious to overrespond to economic changes as not to respond at all.

All of these responses are slower than they should be. The problem of making society more fluid is the problem of hastening these responses. For reasons fully discussed in the chapter on

static and dynamic elements, this lag can never be eliminated altogether; but surely it can be greatly reduced.

Maladjustments in combinations of capacity and efficiency can be reduced by getting market prices to reflect differences in grades more accurately, and by improving methods of analyzing differences in productivity; maladjustments as to size of business by securing better information as to the relation of volume of business to costs and profits; maladjustments between areas and products by obtaining better information as to their relative productivity for different products. Some of these maladjustments can be eliminated quickly and some slowly or not at all.

Some of the variations in cost due to difference in volume of business are clearly unavoidable. For example, it is frequently not possible to increase the volume of grain available to be handled in a given territory, or the consumption of a certain product. The merchant cannot change the winter into one that will move his stock of woolen goods more rapidly; the manufacturer cannot stave off the business depression that reduces his output and raises his costs; the farmer cannot bring on the rain necessary to save his crop of wheat. Or it may be that costs are high because the plant and equipment now on the ground are poorly planned or too large; but it would cost more to scrap them and build new than to continue to use them as they are.

II. ADMINISTRATION

Whether the line of attack is to endeavor to make society more static or more fluid, or both combined, obviously the first great need is for more information, and the second, for means of disseminating and getting people to use it. Two kinds of information are needed, one, of all current changes of economic significance, such as in production, consumption, price, imports and exports and other movements in trade; the other, of information of a more permanent type, mostly physical, such as the relation between inputs and outputs, physical characteristics of soil, feed, and supplies of all kinds, physical capacities and efficiencies of individual production elements. To obtain such information, first more machinery must be set up for collecting it, and second, better agencies for analyzing it.

The next great problem is to get people to use the information after it is collected. Many have already despaired of any progress

along this line. They say that if information is published showing a large production of flax in Argentina, many farmers in the United States will reason that their neighbors will be reducing their acreage because of it, and hence that it will be a good time for them to increase theirs. There is some truth in such a contention. It is also true that producers generally lack faith in the accuracy of the data which are given them. They have ample reason for this in past experience. But these objections are not conclusive. We really have had no experience upon which to base a judgment as to what producers will come to do after they have been supplied with good information for a period of years.

More drastic methods of control than the foregoing are sometimes advocated and practiced. Subsidies, either direct or in the form of protective tariffs, are sometimes given to encourage production along certain lines. Brazil levied super-taxes upon additional acreages of coffee plantation. Coöperative associations have proscribed additional plantings of cotton, tobacco and grapes.

The foregoing raises the further question as to the proper administration of measures for reducing maladjustments. Under whose direction shall the research be prosecuted? Who shall disseminate the information? Who shall instruct in its use if this is necessary? Who shall enforce regulations designed to control production? There are those who incline toward making all these activities public functions, and others who incline to leaving them to individuals or to associations of individuals. Suffice to say on this question at this point that small producing units such as stores, farms and households have not the means individually to carry on such research, nor to obtain instruction in the use of the information after it is obtained. There are only two options for them, one to have the state do it for them, the other to organize into associations of various kinds and thus do it for themselves. Progress is being made along both lines. The rôle of public agencies in facilitating or regulating adjustments will be discussed in detail in a later chapter under the head of "The Function of the State in Production." This chapter will consider only the work of private agencies. The problem so far as private administration is concerned centers around the combination of private agencies for this purpose. By uniting their efforts in various ways, groups of producers have already accomplished much in reducing maladjustments, particularly certain types of them. Combina-

tions of this kind have probably accomplished more along these lines than all public agencies combined. They will probably continue to do so.

III. COMBINATION AND COÖPERATION

Combinations of business units for the purposes above outlined and other related purposes occur in all sorts of conditions and degrees. Sometimes they involve merely a certain amount of combining of management; in other cases the actual detail work of production is more or less integrated. At one extreme may be complete amalgamation of the plants so far as ownership and administration is concerned; and at the other extreme, nothing more than the joint handling of some detail of the business of the several concerns, such as collecting for damages to goods in transit, determining credit ratings of customers, or securing favorable legislation. Before these various forms and degrees of combination can be analyzed intelligently, an understanding is needed of some of the fundamental principles involved in combination. Distinction must be made between the foregoing objectives of combination, which are highly commendable, and some which have grown up along with it which are highly objectionable. It will also appear that not all even of the commendable purposes of such combination are included under the head of control of maladjustments. Some of them are more properly described as attempting to secure the advantage of large-scale operation. It was thought advisable in outlining this textbook to concentrate the whole subject of combination and its objects in one chapter, and this chapter seemed to be the best place for it.

Competition and Coöperation.—Before proceeding to discuss in detail the various conditions and degrees of combination, we must make clear a few concepts connected with it. One of these concepts is that of *economic competition.* It is commonly said that the economic system in which we live is a *competitive* system. The import of such a statement is essentially that economic activity in our present economic system is in large part carried on by self-seeking individual or group units. It also implies that the things that we do thinking solely of our own interests considerably exceed those that we do thinking of the welfare of others, or even of the whole group to which we belong. Given several individuals or groups each trying for the same thing at the same time, the

result must be some kind of a conflict or struggle. In athletics, we usually speak of this conflict or struggle as rivalry. In international affairs, it sometimes breaks out into open warfare. In economic affairs, we always call it *competition.* If one were looking for a single statement that would describe economic competition, one would probably say that *it consists of two or more persons, or groups of persons, striving against each other for the same economic advantage.*

It is necessary to include the phrase "groups of persons" in the statement because a considerable part of competition in these days is between groups rather than individuals, for example, between companies, or between associations or societies. But this brings us to the point that although the members of a company compete in their corporate identity with the members of other companies in their corporate identity, as individual members of their companies they do not compete with each other, but *co-operate* instead. This brings us to the concept of *coöperation* as a sort of antithesis to competition. If competition is summed up in the spectacle of two or more persons striving *against each other* for some economic advantage, coöperation is equally well exhibited in the spectacle of two or more persons *striving with each other to attain an economic advantage.*

One might illustrate it in the field of intercollegiate athletics as follows. Let us suppose that two schools have each entered two men in a mile race. The two men on either team can run their race in two ways, one, by letting each man do his individual utmost to win, the other, by having one of the men assist the other to win, by setting too fast a pace for the opponents in the early part of the race, or by various other strategies. The first procedure typifies pure individual competition; the second, coöperation between the members of each team. In most athletic contests, "team work" is absolutely essential to success—and team work is coöperation.

One important aspect of coöperation is brought out better by the following analogy: Imagine three men in haste to enter a burning building over a ladder which they have raised to a window. Suppose all rush at the ladder at the same time, fight for a place at the foot, and then finally all try to climb at the same time—with the result that perhaps none of them ever gets to the top because the ladder topples over or gives way under their weight. This

would be the way of absolutely unbridled competition. The coöperative procedure, in contrast with this, would be for two to hold the ladder while the first one climbed, and then for this one to help hold it while the other two came up after him.

Most economic activity is a mixture of competition and coöperation. Most competitors coöperate in some particulars. The competing manufacturers of several brands of oleomargarine may work as a unit in opposing restrictive legislation. The competing automobile manufacturers in Detroit may coöperate in securing favorable freight rates to New York. They may even go so far as not to bid against each other for labor, or not to undersell each other in a foreign market. When we come to discuss combination in the concrete, we shall find that most forms of combination involve coöperation in one form or another; and some are almost solely based on coöperation. This is particularly true of combinations in the field of consumption and agricultural production.

It will be apparent that this distinction between competition and coöperation is of fundamental importance. It is possible to conceive of a whole economic society functioning in a competitive way, or in a coöperative way. Various economic philosophies have conceived economic society as patterned in one or the other of these two ways. The economic society of Adam Smith's so-called *laissez faire* philosophy was largely based on the competitive idea. His school of thinkers believed essentially that when each individual sought only his own interests, presumably by a direct approach, the greatest good to the greatest number was bound to result. On the other hand, the so-called Christian Socialists, and many isolated thinkers outside of this school then and since have visualized all manufacturing as carried on in "coöperative workshops," all farming as carried on on great coöperative farms, and all merchandising as carried on by great coöperative store organizations. As it is, the people of some countries are more coöperative than others. The Danish people are more likely to coöperate and are less individualistic than the people of the United States. Ability to coöperate, however, is not a matter of fundamental disposition of the people. It is merely a matter of habit. Some have learned the coöperative mode of economic functioning.

It should be recognized that all government is merely an organized form of coöperation. Whatever the differences in origin

of the practices involved, so far as the present situation is concerned, the essential difference between having a group of citizens form a coöperative organization and establish a store or an elevator, and having a city vote to bond itself to install a system of waterworks or build a schoolhouse, is that in the former case each individual is free to participate or stay out of the enterprise, whereas in the latter case he is compelled to participate in it by paying taxes once the requisite majority has voted in favor of it. In other words, government means compulsory coöperation, at least to the extent of furnishing the support.

Just as there are those who favor an economic system like ours at present in which competition predominates, and also those who would favor a system in which coöperation predominates, so there are those who would favor a system in which government activity predominates. For example, they would like to see our railroads owned and operated by the government, and our street-car systems, and some would even go so far as to want our factories to be government owned and operated. This is the program of the State Socialists.

There is still another attitude of mind on the subject which is generally designated by the familiar term Mercantilism. The modern Mercantilists do not believe in government ownership and operation, but they do believe in a large measure of government regulation. They would control the hours and conditions of labor in many industries, would inspect most of the commodities that enter into the channels of trade, and carefully control all forms of competitive and coöperative activity. The disposition of persons with this set of ideas is not only to be regulatory, but also *paternalistic*, that is, to encourage and stimulate and foster those things which they believe are for the common good.

Competition *vs.* **Bargaining.**—A few pages back, competition was defined as some sort of a contest between persons *striving for the same thing.* This last phrase in the definition is significant. Two factories manufacturing and selling the same product are competing with each other; or two wholesalers or jobbers buying and distributing the same product. But it cannot be said that the factories are "competing" with the wholesalers and jobbers. The name of the activity that ensues when these groups get together on the one side to sell, and on the other side to buy, is *bargaining* and not competition. The two parties to a bargain are

striving for different things, one party to sell as advantageously as possible, and the other side to buy as advantageously as possible. In their selling, the several factories may actually undersell each other. This is competition. Similarly the several buyers may outbid one another. This is also competition.

One of the places in which coöperation has made its greatest inroads upon competition is in selling and buying activities. Many producers of goods have learned that it is advantageous for them not to outbid each other. This has been accomplished in various ways. One is by following the lead of one of the largest or most influential members of the group. Another is by forming into associations of various kinds and degrees, the members of which may agree to sell only at a price which they have all agreed to accept, or to " pool " their products and all take the average price received for the whole pool after all the goods are sold. Labor unions, trade associations, and coöperative marketing associations are all examples of organizations following such practices. A group of individuals or business firms which have agreed to sell as a unit and for the same price are said to be " bargaining collectively." This is a term which has been used particularly by labor unions to describe their methods of wage-making, but it applies equally well to many coöperative and trade associations.

But although a group of competing companies may agree to coöperate in the matter of price, they may still compete in other respects. Railroad companies compete in the matter of service, even though their rates are set by government agencies. The milk distributors in a city may all by mutual agreement be selling their milk at the same price, but at the same time be trying to get as many customers as possible, even if it means taking them away from each other.

Monopoly.—Whenever two or more individuals or firms agree not to compete against each other, but to sell or buy for the same price, they are said to have formed a *monopoly*. Professor Richard T. Ely has defined monopoly as " substantial unity of action on the part of one or more persons engaged in some kind of a business which gives *exclusive* control, more particularly, although not solely, with respect to price."[1] The author would modify this definition by substituting " any degree of " for " exclusive." Monopoly is a matter of degree. An agreement may be able to

[1] *Outline of Economics* (1919), p. 190.

raise prices only temporarily, or only a few points; but it is none the less to that extent a monopoly. Most forms of monopoly have generally been felt to be subversive to the common welfare. Consequently, even as far back as 1602 in England,[1] they have been legislated against and attacked in the courts. The United States Congress enacted the Sherman Anti-trust Act in 1890, and the Clayton Amendment to the first act in 1914; but even previous to the passage of these acts, monopolies were constantly being attacked under the "common law." The federal legislation of course applies only to interstate commerce. However, most of the states have special acts covering monopolies in intrastate business, and where they do not, the common-law precedents are made the basis of legal attack.

The Sherman Anti-trust Act declares illegal "every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several states, or with foreign nations." It also makes any form of monopoly in interstate commerce a misdemeanor and subject to criminal prosecution. It has been found difficult in actual practice to define "restraint of trade" and to prove the existence of monopoly, with the result that the law has not been very effective. The government did, however, win suits against the Standard Oil Company and the American Tobacco Company. The Clayton Anti-trust Act was intended to strengthen the original act. It specifically prohibits a number of unfair trade practices, and "interlocking directorates," wherever the effect of these is to substantially lessen competition. The Clayton Act also exempts labor unions and farmers' coöperative organizations "not organized for profit." Court decisions since, however, have interpreted the provision as to labor unions in such a way as to leave the unions in much the same legal position as under the Sherman Act. The provision as to farmers' coöperative organizations has been revised by the passage of the Capper-Volstead Act, which prohibits such organizations from proceeding in any way that will result in "unduly enhancing the price." Therefore it can hardly be said that any form of effective monopoly has really been legalized.

IV. HORIZONTAL VS. VERTICAL COMBINATION

A combination may involve business units manufacturing the same product, or rendering the same service; or it may involve

[1] Case of Monopolies, 1602. Statute of Monopolies, 1624.

business units that otherwise would be selling to and buying from one another, who come before and after one another in the chain of business enterprises which take commodities from the first primary producer to the consumer. The first type of combination is between competing units; the second, between *bargaining* units. The first type is commonly called *horizontal* combination; the second type, *vertical* combination. This terminology, however, really involves a graphic concept of the production process. The whole production process for any commodity is visualized as consisting of a number of businesses engaged in some one form of primary production—mining copper, for example; then another group of businesses set above these engaged in milling the ore or rock containing the copper; then another group set above these engaged in smelting the copper; then another group set above these engaged in manufacturing the copper into wire and other articles of commerce. Between these will be other businesses which transport the rock or ore or finished copper, or which act as middlemen buying or selling the product in its various stages. *Vertical* combination is combination of businesses set above and under each other in this structure—as if, for example, the mining company also owned and operated or controlled a mill or smelter, or as if a wire manufacturer owned and operated or controlled a smelter, or a smelter and mill and perhaps even a mine. *Horizontal* combination, on the other hand, is a combination of businesses that are opposite each other in this structure—as if several mining companies, or several mills or smelters, were to combine in whole or in part.

For vertical combination, the term *integration* has come to be used commonly as a substitute, probably for the reason that it definitely suggests the principal objective of vertical combination, which is to secure a better coördination of the stages of production. Several units combined vertically and under one control can be kept properly adjusted to one another and rounded out into a working whole with properly coördinated parts—in a word, their production can be *integrated*. How the two types of combination work out in detail will be understood better after the advantages and limitations of each type have been discussed.

Advantages and Limitations of Horizontal Combination.—The gains that accrue to the horizontal type of combination are particularly the following:

1. More differentiation in management is possible. Many of the managerial functions can be transferred to the central office of the combination where they can be organized more efficiently, more use being made of specialists, and a higher grade of ability being secured for the top rank of management. At the same time, the managerial functions left to the individual unit can be handled by men especially adapted to these particular functions.

2. At the same time, probably a better fit of capacities of management can be secured. The functions left to the local management can be of such dimensions that they can be handled advantageously by the management put in charge. This is particularly important when the local units are small, as in the case of stores, elevators, processing plants and the like.

3. By-products from several small units can sometimes be assembled at one point for processing.

4. The organization may be large enough so that it can afford to carry on research work of one kind or another, or try out experiments in some of its plants for the benefit of the whole.

5. Functional specialists of various kinds can be employed who work from plant to plant, or who perform certain services for all of them. They can work out such things as least-cost and highest-profit combinations for each plant.

6. The organization can do more effective advertising than the several units acting separately. In the first place, a large part of the competitive element in advertising, which is so wasteful, will be eliminated.

7. Especially if the local units are small, important savings can be realized in transportation costs by assembling the products or supplies of several plants into carlots. The creameries of Minnesota accomplished this a few years ago. Butter has to be shipped as rapidly as it is produced, and only the larger creameries have a carlot to ship at a time.

8. The members of the combination, now operating as one unit, can surrender to each other all their patents, copyrights and secret processes.

While much has been made, and will continue to be made, of the foregoing advantages of horizontal combination, and beyond any doubt, they are of great importance, still the primary motive of many horizontal combinations is the eliminating of competition, and the realizing of some measure of monopoly advantage. If

the combination is to secure monopoly advantage in selling a product which has a national market, it must include a considerable proportion of all the producers of the product in the country. This is easily possible for commodities that are produced in limited areas, like anthracite coal, or raisins, or perhaps petroleum. It is still possible for commodities with less limited areas in which they are produced, such as iron and copper, and perhaps lumber. If the product is one which has a local market only, like milk, the monopoly can extend only to the point where it will pay to ship in from an outside area. The same is true of combinations of buying units—they may secure a small monopoly advantage due to location. All monopoly advantages, especially those of a local nature, therefore tend to be more or less temporary, to last only until new producing units are established.

The limitations on horizontal combination grow principally out of the limitations on delegation of management. When managerial functions are transferred to a central office, the managers are separated from the several local units which they serve. There is always a tendency for those in the central office to overlook the practical details, or to be too objective in the handling of problems affecting workmen. The local managers are also not likely to be as careful and painstaking as they would be if their own capital was principally at stake. All of these limitations are customarily summed up under the head of the "weaknesses of absentee management." These are of course also weaknesses of vertical combination.

It is also sometimes pointed out that horizontal combination tends to standardize methods and products too much, and that this has the effect of stifling progress in the industry.

Advantages and Limitations of Integration.—The advantages usually ascribed to integration are as follows:

1. Production at one stage can be adjusted to the needs of other stages. It is what can be sold from the last unit of the chain that determines what is needed down the line. There is no need of keeping a mine going if the smelter cannot dispose of its product; or cannot dispose of it at a price that permits the whole to operate at a profit. This advantage is particularly important because of the fact that business is greatly affected by alternating periods of expansion and contraction. This means that plants at various stages must keep in close touch with the market for finished goods

if they are to escape overproducing and underproducing at various periods. It stands to reason that an industry which is well integrated can do a better job of keeping production properly adjusted to the market than one which is made up of uncoördinated producing stages.

The same conclusions apply to the type or kind of product needed. This is not so important in the metal industries as in the food industries. It is notoriously true at present that farmers frequently do not produce the types and quantities of products that the market would take to best advantage. The farmers have too generally proceeded upon the assumption that it is their business to produce the raw materials, and for the middlemen and manufacturers to find a market for them. They usually have found a market, but it has often been at a discouragingly low price. If the farmers were directly in touch with the markets in which the consumers buy, they would soon change their philosophy on this point. Consequently when they organize into coöperative associations and reach out and take over actual selling in actual consumers' markets, or in markets appreciably nearer the consumer, one of the first results is that they begin to produce the types and qualities of goods wanted by consumers, to sort their products more carefully, and to submit to careful grading and inspection.

2. Selling and buying costs can be reduced. In fact, the only selling costs that are left are those of selling from the last unit in the chain. A plant manufacturing automobile bodies which is a unit in an integrated system will have no sales department, and no advertising expense. The automobile manufacturer who secures his engines from a factory which is part of an integrated system will have no problem of buying.

3. Transportation costs can be reduced, partly because the various units in the chain can be so situated with respect to each other that hauling distances can be minimized, or cheap water hauls can be taken advantage of; and partly because special transportation facilities can be provided, and hauling can always be in carlots or full trainloads, and rolling stock can be kept in constant use. This advantage particularly applies to bulky commodities such as ore, coal, and saw logs and lumber. The United States Steel Corporation has realized many advantages of this sort. It has located its steel plants at a point where coal

and iron ore can be brought together economically, and has developed its own transportation system for handling its ore. It even owns the railroads that haul its ore to the docks, as well as the docks and ore boats.

4. The channels of commerce can be kept more open, so that goods will flow more freely from primary producer to consumer. This particularly applies to products whose volume is uncertain because of the weather. Under our present largely unintegrated marketing system, it frequently happens that prices are so low in the primary or producers markets that producers cannot afford even to harvest the crop, and yet many consumers are refraining from buying because the prices are so high. In other words, prices in the consumers' market do not quickly and adequately reflect conditions in the producers' market. The loose links in an unintegrated marketing system take up all the slack. An integrated system could begin first of all by lowering the price to the consumer and advertising it freely. This would start a larger volume of product moving, and this would reduce costs all along the line to a point where the growers could probably harvest the crop to advantage.

5. Integration means an increase in the volume of business handled under one management. This permits a greater differentiation in management, and along with this in many cases a better adaptation of individual management to tasks. This is best illustrated by an organization like a chain store. The buying is largely done by a department in the central office, as well as a good part of the accounting. The manager of a unit in a chain store therefore becomes nothing much more than a head salesman, and he can be chosen with this sort of a task in mind. The buying can be differentiated by commodities, so that the person who buys the butter can be one who is an excellent judge of butter and thoroughly acquainted with the butter market. The accounting force can have a head accountant who is thoroughly familiar with principles of accounting, but most of the rest of the accounting force need be nothing more than clerks. The head of a large integrated organization can be a captain of industry of the first order.

But integration has its limiting factors also. Chief of these are the following:

1. The usual limitations of delegation of management. These limitations probably appear sooner in vertical than in horizontal

combinations, and sooner in horizontal combinations than in single plants, for the reason that the management is spread over different units perhaps widely separated from each other, and furthermore, the units may be doing different things, rendering different services, or handling a product in different stages. The central management of the United States Steel Corporation is managing mining, smelting, and railway and water transportation as well as steel manufacturing.

2. Frequently the most economically sized unit for one stage in the production process is larger or smaller than for some other stage. This means either that not all the units in the integrated system are working to best advantage, or that some have a surplus to dispose of elsewhere, which may be difficult to arrange in a hostile market, or that some deficits must be made up by outside purchases.

It will be apparent that integration in an industry in and of itself does not involve any monopoly. If, however, the integrated organization expands horizontally until it takes in a large part of the volume of business in a certain industry, then it may acquire monopoly power—as if a steel manufacturing organization were to reach back and control most of the smelteries or iron mines.

Many of our combinations are mixtures of horizontal and vertical combination. This is particularly true in fields of production which have small primary units, such as stores, local buying agencies, farms, etc. In such cases, the real objective is frequently integration; but combination is necessary before integration can be undertaken. To illustrate, farmers may be desirous of controlling their live stock till it reaches the central market. But only very large farmers can take their livestock through to the central market—those who have a carload to sell at a time. If a hundred of them will combine into a shipping association, then they can ship a carload nearly every week. The combination in the first instance is of horizontal units; but once combined, they reach out and take in a second stage in the process, that of assembling and forwarding to the central market. This is a first step in integrating. Once they have done this, they may unite with other local selling units and take on a second stage, the selling of their live stock to the packing plants. This they have already done in many live stock markets.

Similarly chain stores are horizontal combinations of local units;

but one of the principal objectives of such combinations is the eliminating of the wholesaler and buying direct from the primary producers or their agents. A line elevator organization is principally for the purpose of providing the grain needed for further marketing operations.

In all integrated organizations, the most important question is that of the localization of the control. In the steel industry, it is undoubtedly the steel manufacturer who is in control and adjusts all the other steps in the process to fit in with his objectives. In the live stock industry, it is with the farmer; but in the meat industry, it is with the meat packer. In a private line elevator, it is with the grain or terminal warehouse unit in the central market. There are three tendencies at present under way in food products, one for central marketing agencies to reach before and after and control the marketing process from beginning to end, but especially from the beginning; another for the primary producers to reach at least as far as the central market and control the marketing process from their end; and the third for consumers to reach through the retail store clear through to the central market, and in some cases farther. In the anthracite coal industry, at one time at least, the transportation agency, the railroads, had the control. Congress tried to prohibit this when it passed the so-called Hepburn Act with its clause prohibiting railroads from owning or controlling the commodity which they transport.

In whose hands the control most properly resides is a special question to be settled for each industry or product. There are other questions involved than coördination of production and economy of operation. One of these is the security which the primary producers on the one hand, and the consumers on the other hand, have or feel that they are not being exploited for private gain by those in control.

V. DEGREES OF CENTRALIZATION

A combination in which a high degree of control is given to some part of the organization is said to be highly *centralized*. One in which the various units or plants in the combination have a high degree of local autonomy is described as a *loose association*. Also the term *federated* is frequently applied to it. Combinations exist in all degrees between highly centralized and weakly federated. Following are some of the commonly recognized types:

Ownership—Mergers.—The most complete form of combination is absolute ownership of the different units in the combination. Thus a certain manufacturer of shoe-making machinery might buy several competing plants and operate them under one central management. This is the way many combinations have come about. Usually the purchases are made one at a time, as the company accumulates the necessary surpluses, or as additional loans can be made or shares of stock sold.

The same effect as the foregoing is achieved when several competing companies unite into one large corporation, each taking shares of stock in this corporation as pay for its properties. The central management of the new corporation is likely to be composite of the former management of the several companies, whereas in the former case, the management of the purchasing company is likely to continue in power unabated. Combinations which grow up in this latter way are generally called *mergers*. They may exercise a large measure of control over price. New companies may come into the field, but they will have to compete with the merger, and the contest will be an unequal one.

Trusts.—Next in degree of control is the *trust*. In a trust, the several companies preserve their identities somewhat, but turn over to a board of trustees the control of their plants by assigning their stock to them in trust, with its full voting power, in exchange for "trust certificates." It is not likely that the board of trustees concerns itself with local management policies greatly, but rather with matters of major policy. The first trust to be declared illegal was the sugar trust in 1890. Trusts in the strict technical sense have largely disappeared.

Holding Companies.—Next in degree of control is the *holding company*. In this form of combination, the several companies involved in it exchange a controlling interest, represented usually by over 50 per cent of the shares of stock, in their company for shares of stock in the holding company. Each company retains its separate local management, but the policies of the separate companies are all subject to the control of the holding company. The control is exercised principally in matters of price and financial policy. The United States Supreme Court ruled in the Northern Securities Cases in 1904 that holding companies were at least open to attack under the Sherman Antitrust Act.

Pools.—When a *pool* is formed, the units in it all retain their identity completely. They merely agree to coöperate in the selling of the product or in some other detail of their businesses. The usual types of pools are *price* pools, *expense* pools, and *traffic* pools. In a price pool, the several companies all agree to take the same average price for their product, or the same grade of their product. They might do this by letting each sell its own product as before, and then combining the results and striking an average. Such methods have been used in the past, but would surely be declared illegal to-day, since they will hardly be employed save for the purpose of stopping competition. The more usual type of pool to-day is one in which the different units employ the same selling agency, or create a joint selling agency of their own, which sells the products of all to the best possible advantage, and distributes proceeds at a uniform rate to all for the same grade of product, or at the same rate for all grades of product in cases where grades are difficult to distinguish, after deducting the expenses properly chargeable to each member in the pool. This is the method employed by many of the coöperative organizations selling farm products. If the pool includes most of the product in question, the price obtained may in effect be a monopoly price. But unless the output of this product can be curtailed in the future, there is no object in holding for a monopoly price, for this will only result in the holding over of a part of the crop to be sold next year along with the new crop. For this reason, as already partly explained, pools of farm products have generally been accepted as not inimical to the public welfare. Moreover, most pools are more or less local in nature and include only a part of the total supply. The reasons for pooling farm products are mostly of another nature, for example, to secure sufficient quantities for economical handling or proper sorting and grading, or to furnish a basis for establishing a properly coördinated organization, or for conducting a selling and advertising campaign.

The plan of "buying for cash" patterned after the Rochdale coöperative store plan of selling, is merely a variant from pooling. The payment which each member in the pool receives at the time he delivers his produce, according to this plan, is as near current market price as can safely be paid. Whatever more than this the association realizes upon its sales is distributed at the end of the year as a "trade" or "patronage" dividend.

Pooling methods may be used in buying as well as selling. Thus a number of small manufactures may pool their orders and buy a carload of salt. To the base price per barrel paid for the carload f. o. b. shipping point will be added the prorated freight and dray-age cost and other expenses, and any special expenses chargeable to each member in the pool, and the result will be the price per barrel to the buyer. The commonest form of buying pool, however, is that represented by the coöperative stores. It is one of the cardinal points of practice of the Rochdale scheme not to undersell competing private enterprises, but to charge the same prices, and then return whatever balance there may be as a trade dividend. This makes the competition between the coöperatives and the private merchants much less apparent, and reduces friction between them.

Expense pools arise when a number of individuals or firms unite in some undertaking requiring an expenditure of funds—such an undertaking as advertising, or lobbying for favorable legislation, or carrying a case through the courts. The expenses are levied against the various members according to some basis that has been agreed upon in advance. All buying and selling pools have expenses to pool as well as receipts. The problem of prorating expenses in such cases is frequently difficult. Some expenses are most equitably distributed per dollar of sales or purchases, others per hundredweight, others per month, etc.

Traffic pools are agreements to divide patronage in a certain way or in a certain proportion. Thus two lumber companies in a small town may agree virtually not to bid against each other on lumber orders submitted, and to divide the business between them in a certain ratio. In a certain small city in Wisconsin, two lumberyards once agreed that the first one to whom any order was presented should receive the order. Both would figure on it, of course, but the other lumberyard's figures would always be appreciably higher. In the days before legislation prohibited, the railroads operating between Chicago and the East made agreements of this kind as to the division of freight traffic. If the percentages did not come out as agreed upon at the end of the year, arrangements were provided for adjusting the differences. The Federal Trade Commission has recently suggested that the large meat packers in the United States, "the Big Five," have such an agreement between them as to division of live stock offered for sale in the vari-

ous markets. The division may also be on the basis of territory, each of several competitors agreeing not to enter the territory assigned to another in the group.

Loose Associations.—A loose form of horizontal combination is the so-called *open-price association.* This is an association of firms engaged in manufacturing and selling a certain product for the purpose of exchanging price and sales information. The members of such an association agree to keep each other fully informed as to the prices at which they are selling. Each member in the association reports the prices and dates and other significant information for all sales made. The secretary of the association compiles the information and transmits it to all the members. In its pure form, such an association has in it no semblance of an agreement as to what price shall be asked. It is believed by many, however, that the effect of such a practice is to keep prices upon a higher level, especially at a time when prices should properly decline; and no doubt practices are resorted to by some such associations that are clearly of the monopoly type.

The functions of an open-price association are frequently combined with those of an ordinary *trade association.* Trade associations engage in all sorts of activities for the good, or supposed good, of the members of the trade. They arrange and hold annual conventions, publish magazines or journals, raise funds for supporting research work in their field, lobby for favorable legislation, advertise, defend themselves against the public, pass resolutions in behalf of the common good as they see it, etc.

VI. COMBINATION IN THE VARIOUS FIELDS OF PRODUCTION

Further discussion of developments in combination is best taken up by individual fields of production. Manufacturing, marketing, transportation and finance are selected for this special consideration.

Combinations in Manufacturing.—The United States census has never attempted to make its data show degrees of combination. It has been content to discover the existence of "central office groups," that is, groups of two or more establishments sufficiently independent to keep separate books of account, but controlled from one central office. Mr. Willard Thorp has made an analysis of the data of three central office groups in Census

Monograph III called *Integration of Industrial Operation.* The data include central office groups operating only one manufacturing establishment and one or more establishments in other fields. Thus 534 of the central office groups operated also in the field of mining.

Table LIV shows that central office control is not limited to any one group of industries; and that 7.4 per cent of all manufacturing establishments included in the census are controlled by central offices. The percentages are largest in those fields requiring a great deal of capital and especially in railroad repair shops and chemicals. The data do not show the size of the establishments controlled, but it is estimated that they rank above the average for all establishments and probably employ one-third of all the wage earners.

TABLE LIV. CLASSIFICATION OF CENTRAL OFFICE GROUPS BY FIELDS OF INDUSTRY, 1919[1]

Groups of industry	*Number of central office groups*	*Number of establishments controlled*	*Average per central office group*	*Per cent of all establishments controlled*
All industries	5838	21,464	3.68	7.4
1. Food and kindred products	1094	4,544	4.15	7.4
2. Textiles and their products	923	2,832	3.07	9.9
3. Iron and steel and their products	466	1,602	3.44	8.0
4. Lumber and its remanufactures	942	2,829	3.00	7.1
5. Leather and its finished products	145	495	3.41	7.7
6. Paper and printing	273	918	3.36	2.5
7. Liquors and beverages	87	268	3.08	4.2
8. Chemicals and allied products	629	2,409	3.83	19.7
9. Stone, clay and glass products	434	1,100	2.53	8.8
10. Metals and metal products other than iron or steel	119	445	3.74	4.2
11. Tobacco manufactures	117	533	4.56	5.2
12. Vehicles for land transportation	65	287	4.42	1.4
13. Railroad repair shops	187	1,850	9.89	78.1
14. Miscellaneous industries	357	1,362	3.82	6.3

[1] From Tables 42, 43, 44 and 45 of *Integration of Industrial Operation.*

TABLE LV. NUMBER OF ESTABLISHMENTS OPERATED BY CENTRAL OFFICES[1]

	Total	Number of establishments						
		1–2	3–5	6–10	11–15	16–25	26–50	Over 50
Number of central office groups......	5838	3576	1573	424	116	84	47	18
Per cent distribution	100	61.3	26.9	7.3	2.0	1.4	0.8	03

[1] From Table 46 of *Integration of Industrial Operation.*

The size of the central office groups can best be measured by the number of establishments controlled. Table LV does not include establishments in other fields of production, nor those outside of the United States. Many concerns, such as the Ford Motor Company, the International Harvester Company and the Hershey Chocolate Company, have foreign branches. A few industries, especially those manufacturing sugar, branch out into agricultural production. Many of these central offices also operate transportation units or wholesale or retail units. But the most important establishments indicated outside of manufacturing are in the extractive industries of mining and lumbering. These extractive industries lend themselves to large-scale production; but the principal reason for the integration is the need for a supply of raw materials or for processing plants near at hand. The sawmills cut 70 per cent of the logs milled by them.

The greatest distance between two establishments in one group is represented by a fish canning and preserving company with its main office and one establishment at East San Pedro, California, and the other plant at Eastport, Maine. More than half of the central offices have establishments over one hundred miles apart, and the average distance is 273 miles. The wide distribution of these plants is an indication that improved systems of transportation and communication have reduced the importance of distance as a limiting factor. The chief factors effecting location are sources of raw materials, perishability of product, and markets.

About 72 per cent of the central offices were located in the same city as one of the establishments. There is no general tendency towards location at some central point between plants. The tendency instead is for the central offices to be concentrated near markets in larger cities. Nearly three-fifths are in cities over

500,000, and over four-fifths are in cities over 100,000. New York, Philadelphia, Chicago and Boston are the most important locations for central offices.

These central office groups may be classified as follows:

A. Those making similar products—horizontal combinations.

B. Those making related products—integrated combinations.

C. Those making dissimilar and unrelated products.

The second of these classifications can be further subdivided into six groups.[1]

A. *Similar Products* (*Horizontal Combinations*). Of the 4813 central office groups operating 18,912 establishments whose records were complete enough to use in this analyses, 3029, or 62.9 per cent, operating 9913 or 52.4 per cent of the establishments, are combinations only on a horizontal bases. They produce identical products. Combinations only mainly horizontal, operating even one plant that manufactures another product, are not included in this group. Although these central office groups control only 3.4 per cent of all manufacturing establishments in the United States, there are 63 industries out of a total of 354 in which they control over 10 per cent of the establishments. The percentage runs high in such industries as charcoal, explosives, beet sugar and condensed milk, where raw materials are made into finished products in one operation; also in such lines as gas plants and railroad repair shops where one plant serves a community, and expansion requires putting a new plant in another locality.

These combinations are usually small, 87.7 per cent of them controlling less than 5 establishments, as compared with 29.4 for another form of combination explained later. This is partly due to the fact that this type of combination is a step towards a more complex form. As soon as a few plants are combined they can profitably manufacture some related product, which puts them into another classification.

B. *Related Products* (*Integrated Combinations*). This group includes 1737 or 36.1 per cent of the central office groups. Only in a broad sense can the term integrated be applied to them. This group is further subdivided on the bases of relationship of products. Since many fall logically into one or more classes there is some duplication.

[1] This classification follows the terminology and analysis of this book and departs widely from Mr. Thorp's in several important particulars.

(1) The largest group of 903 includes plants representing successive stages in the production process. They are mostly combinations of extractive and manufacturing enterprises. There are 199 such combinations in the group called " lumber and its manufactures," 195 in " chemicals and allied products," 134 in " iron, steel and its products " and 126 in " stone, clay and glass products." There are few such combinations in "foods and kindred products" because in this field one manufacturing process usually puts the products in finished form.

(2) The next largest group of 427 represents integrations of plants manufacturing supplementary products from the same raw material. Only those are included which turn out products which can be manufactured independently of one another—not by-products. This kind of combination is most important in " foods and kindred products," and here is mainly a combination of plants manufacturing milk products, such as butter, cheese, condensed milk and ice cream. It is also important in " textiles and their products " and includes such products as knit and woven goods, rug and cloth goods, felt and wool cloth, silk gloves and neckwear. These combinations are largely due to limitations set by market conditions on expansion of business in one line, but also partly due to supplementary relations in buying of raw materials and selling of products.

(3) A group of 220 are better described as complementary enterprises. This type of combination is quite common in all groups of industries and includes service enterprises of various kinds, maintenance enterprises, repair shops, complementary transportation enterprises, manufacturing of supplies such as fuel or ice and especially containers, and the production of parts, such as buttons for clothing, or automobile parts.

(4) A group of 125 manufacture by-products. It is to be remembered that this number includes only cases where by-products are manufactured in separate establishments keeping separate books.

It is worthy of note that combinations of this kind average nearly 10 establishments per central office. This type of combination is most important in industries producing food products, iron and steel products and chemical products, and by far the most important by-product resulting is fertilizer in various forms. Research conducted by large enterprises is making combinations of this kind of production more important.

(5) Another group of 154 use similar processes but make different products from different raw materials. This type is most important in production of foods and kindred products, in such industries as the canning of fruit, vegetables and fish; baking of bread, and confectionery goods; and grinding and milling of various grains. It is also common for blast furnaces to smelt different kinds of ores, and refineries and crushers to produce various kinds of oils. These enterprises supplement each other in the use of the skill and knowledge of the management.

(6) Another group of 233 manufacture dissimilar but related products for the same market. Beds and mattresses, different kinds of building material, electrical supplies, druggists' supplies, dental supplies and jewelers' supplies, are examples of such combinations.

This group also includes many public utilities producing gas and electricity and also manufacturing mantles, stoves, light bulbs, and motors for sale in the same market as their main product. The supplementary relationship in this case involves the use of the same marketing machinery.

C. *Unrelated Products.* This group contains only 47 central office groups, but is interesting because it shows that economical combination is not confined within narrow limits. If these combinations are analyzed closely, either complementary or supplementary relationship will usually be found. Mining companies have to buy the land they mine, and they find it more profitable to cut the timber from it or farm it than to let it lie idle. Very often an entire town is dependent on one mine or factory, and the management finds it profitable to enter other businesses for the convenience of the laborers in order to obtain the grade of labor needed.

One canning factory operates a sawmill and logging camp so as to give steady employment to its skilled labor in the canning factory.

As explained in another chapter, it is evident that many individual establishments have reached the most economical size, and that further economies cannot be gained by larger establishments, but must come from economies in management of these establishments. Therefore it is reasonable to expect continued growth both in size and number of central office groups, and perhaps later a decrease in number of these with an increase in size.

Combination in the Field of Transportation.—The early railroads were short lines leading out from important cities. The formation of New York Central connecting New York City with Buffalo in 1853 ushered in a period of end-to-end consolidation of lines between important cities. This period lasted until about 1873 when there were 69 such combinations controlling from 200 to 959 miles of railroad, an average of about 389 miles. Between 1873 and 1893, combinations took the form of building up railway systems with branch lines and feeders. By 1893, there were 35 such systems of over 1000 miles each and 5 of over 5000 miles each.

Competition between many of these lines became ruinous, and pooling and other methods of control were tried. These were either ineffective or were prevented by law. About 1893 another step in consolidation was begun. Competing systems were combined by merger, lease or stock ownership into large combinations mainly to prevent competition, but partly for economies in moving traffic.

An investigation in 1905 showed that 39 persons represented a majority of boards of directors of all lines east of the Mississippi. Some of the larger combinations were as follows: All the lines in New England were controlled by the New York, New Haven and Hartford Railroad. The New York Central, managed by Vanderbilt interests, had secured control of 22,000 miles of road, or over one-tenth of the total mileage of country, including lines in the Northwest from the Rocky Mountains through Chicago to New York City. The Pennsylvania Railroad, controlling lines in the Ohio Valley, coöperated with the New York Central to regulate competition of carriers of anthracite and bituminous coal. The Morgan financial interests had acquired the Southern, the Atlantic Coast Line, and the Louisville and Nashville Railroads, and were able to dominate competition in the South. The Gould combination had secured control of 19,000 miles of line extending from the Atlantic to the Pacific Coast. This system broke up after the panic of 1907. The Northern Securities Company, formed in 1901, controlled the Hill lines, that is, the Great Northern and Northern Pacific, which in turn owned the Chicago, Burlington and Quincy. This company was declared illegal by the United States Supreme Court in 1904 and was dissolved, but the lines were still managed by Hill interests. The Union Pacific combination, representing the Harriman interests, had absorbed all of the remaining trans-

continental railroads as well as many in the central states and also owned ships operating between Gulf ports and New York, and between Pacific posts and Asia. Harriman died in 1909 and the system began to go to pieces. This outcome was hastened by a court decision to the effect that the purchase of Southern Pacific was illegal.

The regulation by the Interstate Commerce Commission has greatly restricted competition and has lessened the need for combination from the railroad's point of view. But the Commission finds it hard to fix rates so that all roads can earn reasonable returns on their investment. The Esch-Cummins plan for voluntary combination of railroads has already been described. This represents the next step in combination in this field. The final step may be government ownership and operation.

One of the major maladjustments affecting railroads is the failure of railway rates to readjust themselves quickly enough following changes in the price level. This is a problem for the Interstate Commerce Commission.

Railroads have branched out into many fields in their time. The Hepburn Act of 1906 was directed against the joint ownership or control of the anthracite coal mines of Pennsylvania by a group of railroads. The Act provided that the railroads operating as public carriers must divorce themselves from the business of manufacturing or mining commodities to be shipped over their lines, except timber and commodities for their own use. It has not been possible to enforce the Act in a way to accomplish the ends desired. The United States Steel Corporation owns its own ore boats on the Great Lakes. Railroads have found it advantageous to build and operate terminal grain and other warehouses, stockyards and other marketing facilities in central and seaboard markets.

There does not seem to be the same need for unified control in motor-bus service as in railway service, but the motor-bus lines seem to be going through a period of rapid consolidation at present. It probably reflects in part the economics of larger central office managerial units, and in part an effort to reduce competition with other bus lines.

Combination in Commodity Marketing.—In this section, a few of the many types of combination in the field of commodity marketing will be taken for brief discussion. Chain stores have existed in the United States since before the Civil War; but it is only since

1900 that their numbers have increased rapidly. These chains come into existence in several ways. Some are organized by companies set up for this purpose. Others represent combinations between existing stores. Some result when jobbers or wholesalers take over stores from bankrupt customers. Manufacturers sometimes set up stores as outlets for their own products. In Europe, consumers' coöperatives have established chain systems. Chain stores are found in many retail lines, grocery, restaurant, variety (5 and 10 cent stores), tobacco, shoes, hats, drugs, meats and hardware being the most common.

The chief advantages of chain stores lie in their better buying or bargaining power and in the increased turnover of stocks which often obtain. A small stock is kept in each store, but supplies are available in some central warehouse. Management costs are usually less because the store units do no buying and can use low-salaried managers who follow instructions and rules sent out from the central office. They also make some savings in operating costs by cutting down the amount of service they sell with their goods. How far this movement will continue depends on the relative efficiencies of the two retailing methods. The present tendency is for more independent stores to disappear.

Competition between chains of stores has in recent years led to consolidation of competing systems into larger and larger combinations. Estimates place the number of such systems at over 2000, operating over 100,000 retail outlets, and their volume of business at 10 per cent of the retail grocery business, and 5 per cent of all retail sales to consumers.

Department stores in large cities are also beginning to combine and integrate. In a recent address before the United States Chamber of Commerce, Mr. Filene of Boston's famous department store advocated this as the next step toward more economical department store operation.

Coöperative marketing of agricultural products is another field in which combination and integration have made great headway. These organizations attempt to regulate the flow of their product to market and to control the quality of it through standardization and grading and through education of the producers. These organizations are roughly of two general types, *federated* and *centralized*. Some of them are merely sales agencies or bargaining units. The federated type consists of a combination of local co-

operative units into one central organization which performs the marketing function for all of them. The Minnesota Coöperative Creameries Association, one example of this type, is a federation of most of the coöperative creameries in Minnesota and a few in neighboring states. It is a coöperative capital-stock corporation with its stock owned by the locals. Its purpose is to assemble, grade, and sell the product of the local units. In addition, it handles a full line of supplies for its members. The centralized type of organization in its usual form has no local units, or if it does, they are only for voting or educational purposes, or for the mere physical assembling of the product. The members of such organizations are all members of the central organization direct. The Burley Tobacco Growers' Association of Kentucky, with 108,240 members, and controlling over 75 per cent of the supply, is a good example of this type of organization. Organizations of this type are most important in handling products such as tobacco, cotton, grain and wool, which do not pass through a manufacturing process. The essential difference between the two types is in the degree of control given the central office group.

The growth of both types has been very rapid since 1920. In 1924 there were 35 large federated organizations with an estimated membership of 210,325. Twenty-two, with a membership of 55,110, handle fruits and vegetables, and 7, with a membership of 112,625, handle dairy products.

In the same year, there were 74 more or less centralized organizations with an approximate membership of 879,190. Fifteen of these handle cotton, 15 grain, 10 poultry products, 8 fruit and vegetables, 8 wool, 7 tobacco, 4 dairy products, 4 nuts and 3 miscellaneous products.

These coöperative organizations are horizontal combinations in that they unite primary producers of a given product, and integrated organizations in that they reach first into the local market, then into the central markets, and in some cases clear to the retail market and the consumer.

Although set up to render marketing service, these large coöperative organizations have discovered that they cannot render this service effectively unless they can improve and standardize the product which they are organized to sell. They are therefore reaching back increasingly to the primary production processes and are becoming integrated in the further sense of coördinating pri-

mary production and marketing. At present, the coöperatives are considering seriously the possibilities of effective adjustment of volume of production to the market.

The growth of consumers' coöperatives from the local store to the coöperative wholesale society and even to the manufacturing of food products, represents a similar development from the other direction.

Combinations and Centralization in Finance.—Combination in banking has proceeded along two lines, namely, branching out from a banking center, and the combining of individual banks into larger units. The government of France compelled the Bank of France to establish branches, and in 1913 it had 582 of them. Other governments have permitted establishment of branches, and in 1913 the Imperial Bank of Germany had 488 branches. Five joint-stock banks in London have over 6000 branches. This is also the prevailing type of banking in Scotland and in Canada. The First United States Bank had 8 branches, and the Second United States Bank had 25 branches. The abolishment of the United States Bank, the passing of free banking acts permitting anyone to start banks who had the required capital, and finally the prohibiting of banks from combining, has effectively checked branch banking in the United States. Only 10 states specifically allow branch banking. The most important branch system is the Bank of Italy in California.

But prohibiting branch banking has not prevented combination in finance. The investigation of the Pujo Committee into the "money trust" showed that practically all the large banks and trust companies of New York are united by a system of interlocking directorates. Perhaps the most common form of combination existing consists of coöperating or loose working agreements between large and small banks.

Another form of combination, especially in the Northwest, is called chain banking. Each bank in the chain maintains its corporate identity, but a controlling interest is owned by some individual or corporation usually maintaining a central office in a larger city. In 1916 there were approximately 300 chain banks controlled from offices in Minneapolis and St. Paul. The chain groups varied in size from 2 to 35 banks. One person closely connected with chain banks has estimated that nearly half of the banks in the Northwest belong to such combinations.

VII. TRENDS IN COMBINATION

There have been two opinions prevalent in the country with respect to the proper method of dealing with combination. One has been that the best policy is to restrict it wherever possible and attempt to restore competition. President Wilson favored such a policy. The other point of view has been that combination represents economic progress and should be permitted but regulated. Former President Van Hise of the University of Wisconsin expressed this point of view in his book *Concentration and Control.* This latter point of view is surely coming to prevail. Combination is proceeding at a very rapid rate. There seems little doubt, however, that the power of the government will have to be strengthened to cope with it. Granted that any combination has power to control prices, the next step must be public regulation of prices. That step already needs to be taken in more cases than many people suppose.

SUGGESTIONS FOR FURTHER READING

Alfred Marshall devotes Book III of his *Industry and Trade* (1919), to discussion of combinations, monopolies and trusts, and their economic activities; and Eliot Jones' *Trust Problems in the United States* (1921), covers the same subject from the point of view of an American economist. His *Principles of Railway Transportation* (1924), Chapters XVII, XXV and XXVI, deals in part with transportation consolidation. Industrial combination is discussed by Willard L. Thorp in *The Integration of Industrial Operation* (1924), Census Monograph III. University of Minnesota Agricultural Experiment Station Bulletin 211, *Coöperative Central Marketing Organization* (1924), by J. D. Black and H. Bruce Price, presents the recent tendencies in the consolidation of marketing functions by coöperative methods. The reader is referred to Fred E. Clark's *Principles of Marketing* (1922), Chapter XXVI, Section V, for a brief discussion of present tendencies in marketing combination, and to L. D. H. Weld's *The Marketing of Farm Products* (1916), Chapter XVIII, for another development of the same subject. Harold G. Moulton's *Financial Organization of Society* (1925), Chapter XXIX, discusses the question of financial integration. Chain banking is discussed by Mildred L. Hartsough's *The Twin Cities as a Metropolitan Market* (1925), University of Minnesota, Social Science Study Number 18, and by N. S. B. Gras in his *Introduction to Economic History* (1922), pp. 259–60 and 305–306.

PROBLEMS

1. Why would a perfectly fluid society be almost identical with a static society as far as maladjustments are concerned?
2. What can each of the following do to help solve the problems of maladjustments:
    1. Individual persons.
    2. Individual producing units.
    3. Combinations of producing units.
    4. Educational institutions.
    5. Religious societies.
    6. Government.
3. Distinguish between large-scale organization and large-scale production.
4. Do you agree with the statement that "the economic distress in this country is largely due to competition between employers and employees"?
5. The President promised to aid the farmers in their coöperative undertakings. Would this lessen competition among the farmers?
6. The merchants in one section of a large city put on a big trade campaign last year. Was this both competition and coöperation?
7. What conditions are essential to a monopoly?
8. Why are most monopolies only temporary?
9. Why do governments try to break up monopolies when everywhere about us we can see wastes due to competition?
10. What are some of the wastes of competition?
11. Four methods of dealing with monopolies are open to the government. Which do you prefer and why?
    1. Let them alone.
    2. Break them up.
    3. Regulate them.
    4. Take over the business.
12. Henry Ford is said to be planning the starting of an aëroplane service. Does this mean that his business is becoming more integrated, or is it horizontal combination, or something else?
13. Name some businesses that are highly integrated; also a few that are not and perhaps never can be. State the advantages or limitations that make each one what it is.
14. (a) Are farmers' coöperative marketing organizations horizontal or vertical combinations?
    (b) What is the aim of these organizations?
    (c) May they become dangerous monopolies?
15. In England we find consumers' coöperative organizations (stores) that are highly integrated. What are these stores doing?
16. By the use of diagrams and short statements, show clearly the difference between mergers, trusts, holding companies and pools.
17. Several years ago James J. Hill united the Burlington, Northern Pacific and Great Northern Railroads by forming a holding company which the courts destroyed as illegal. Now the government is trying to force

many of the railroads to unite. How do you account for this change of policy?

18. Is there any form of competition left in a large organization which is horizontally combined and controls all plants making a particular product?
19. Is the vertical type of combination more apt to become monopolistic than the horizontal?
20. Which of the different methods of combinations are hardest for the government to deal with?
21. What percentage of the total capital would one person have to own in order to control completely the entire business if four successive holding companies are superimposed on the producing units?
22. What form or forms of combinations if any would you expect to find in each of the following? Why?
    1. Cobblers in same town.
    2. Truck gardeners.
    3. Retail grocery stores.
    4. Drug stores.
    5. Furniture manufacturing.
    6. Diversified farming.
    7. Automobile manufacturing.
    8. Restaurants.
    9. Educational institutions.
    10. Merchants in a town, city or part of a city.
    11. Importers.
    12. Laborers (other than labor unions).
23. Is one central control of finance more important than a single control over one commodity?
24. Some people say that "competition naturally destroys itself." Do you agree? Or does it simply change its forms?
25. The tendency is towards larger and larger units of control. Is there a limit to the size of these units short of complete control similar to the limit of large-scale production in a single establishment?
26. If all large organizations were corporations with their stocks and bonds in small denominations and ownership was well distributed among the population, could there be any monopoly gains? Explain.

PART SIX

THE SOCIAL ORGANIZATION OF PRODUCTION

CHAPTER XXX

SOCIAL ECONOMY

While by far the larger part of the productive activity of the world is carried on by individual producing units, a considerable part, as explained in the preceding chapter, is carried on by associations of individual producing units, and a still larger part by that great social organization known abstractly as *the state*, and comprising, in the United States, the central government, the state, county and township units, and the cities and villages. While these are essentially political units, many of their activities are economic, and others have great economic significance. More than this, some of these units, particularly the nation and the city, represent partly economic as well as political groupings. Part Six will be devoted to an analysis of this larger social organization. The first chapter will discuss the social or world considerations involved in this analysis, and the two remaining chapters the Economy of Cities and the Economy of Nations.

The point of view in the preceding parts of this book has been largely that of the individual enterprise. But whether the subject under discussion has been specialization, or combination of enterprises, or combination of the elements of production, or the organization of exchange, the social point of view has always been brought into the picture somewhere. But it has nowhere been given adequate presentation. In most of the countries of Europe, it is customary for economists to separate the individual from the social point of view, and even the social from the "national" point of view. Many universities have virtually separate departments of "private economics" and "national economics." The author does not believe in this complete separation. Clarity of thinking, it is true, requires that the three points of view be kept separately in mind; but soundness of thinking surely requires that no one of them be lost sight of anywhere in economic analysis. It is therefore necessary before concluding this treatise to give some special attention to the social point of view. This chapter will review the ground of the preceding chapters from this broader point of view.

It will do it only briefly, and in general outlines. Almost as many chapters could be devoted to this phase of the subject as to the foregoing. But space does not permit.

I. THE CHANGING RATIOS OF THE ELEMENTS OF PRODUCTION

Economics was defined in the opening chapters as the science and art of the most advantageous utilization of human and natural resources. Every chapter since has shown new forms or aspects which this utilization takes. The time has now come to bring all these forms and aspects of utilization together and relate them to the fundamental facts of human existence. The following are a few of these fundamental facts:

1. *The relative amounts of the various elements of production are constantly changing, most of the time steadily in one direction.* Speaking first in terms of the broad classes into which the elements have been grouped, labor may be increasing more rapidly than land, or capital goods more rapidly than labor. Speaking in terms of smaller groupings, skilled labor may be increasing more rapidly than unskilled, or machinery than live stock.

2. The reason for these changing relative supplies is that *different circumstances condition the creation of new supplies of each of the different elements.* These circumstances were presented in a general way in Chapters XIV, XV and XVI. It will be well at this point to reread the sections of these chapters dealing with the supply of the elements.

The usual statement made about land, it will be remembered, is that its supply is absolutely fixed by the area of the earth's surface. If land surface is distinguished from water surface, then the supply of land is capable of being enlarged a little by draining lakes and building out shore lines. Furthermore, although in the area sense the land supply can be increased very little, in the productivity sense, it can be increased considerably. In this textbook, the contributions of man to land which behave like nature's contributions are considered part of the land. These surely have increased the productivity of much of the land surface of the earth many times over in the past. Since long before the dawn of history, man has been busy subduing the forest and the jungle, leveling, removing stones, draining, irrigating and terracing. Only 13 per cent of the area of Japan is tilled land, but not half of this would be tilled if it were in the United States. So far as the future

of the United States is concerned, it was estimated that its "improved" land area might rather easily be increased at least a half. But there is an obvious limit to making the land surface more productive by improving it. Once a country is well occupied, further steps in improving the land come only at great effort. Hence, although it is inaccurate to say that the land supply considered in the productivity sense is fixed, nevertheless it must be conceded that it can be increased only within limits and with increasing difficulty at each step.

Capital goods, considered in the aggregate, arise out of the surplus of present production over present consumption. Therefore the greater the volume of present production, present consumption being the same, the greater the supply of capital goods. Likewise, the less the present consumption, present production being the same, the greater the supply of capital goods. The greater the natural resources, and the more diligent or efficient the workers, the greater the volume of present production. The more thrifty a population, the less the present consumption. The larger the per capita output, the greater the surplus over present consumption. A densely populated country can have an appreciable surplus only if it has mineral wealth to draw upon. The surplus of each worker over present consumption is so small in a densely populated country that only a little saving is possible. Some forms of capital goods draw heavily upon natural resources; others mostly upon labor. The former are restricted in their possibilities of increase much after the manner of land; the latter after the manner of labor. As the resources of the earth become more fully utilized, the increase of capital goods will arise more from labor and less from natural resources. Under all circumstances, the urge to save will be an important determining factor. It is obvious from the foregoing that capital goods are capable of more continued increase than land. The land improvements mentioned in the preceding paragraph, however, are like capital goods so far as their manner of increase is concerned. They differ from capital goods in the respect only that their increase is somewhat more definitely restricted by the area of the earth's surface.

The *labor supply* can be increased by mere reproduction of the population, or by putting a larger proportion of the population at work, or having them work longer hours, or making them more efficient or increasing their capacity. These ways of increasing

the labor supply conflict somewhat with each other. If young people go to work early in place of getting proper education and training, their efficiency and capacity later are greatly reduced. The same is true if they overwork at any period. If women work much in industry, the birth rate is reduced, and at the same time the infant mortality rate is increased. If men and women postpone marriage, the ratio of workers to the total population increases. In some of the densely populated regions of the earth, so large a part of the population is so close to the margin of subsistence that work and reproduction conflict with each other. The energy which has to go into work in order to earn a subsistence for the workers makes it impossible for them to bring infants into the world in proper condition, and even more impossible to care for them properly after they are born. On the other hand, the energy which goes into childbearing and care of infants detracts from the productive capacity of the workers. It is now generally apparent in the world that about the most ineffective of the foregoing ways of increasing the labor supply is merely to increase the number of workers; that fewer workers properly fed and clothed, trained, and properly equipped will turn out more work than a much larger number of workers under opposite conditions.

The circumstances conditioning the increase in numbers of the population were first elaborated by Thomas Malthus in 1798 in his *Essay on the Principle of Population as it Affects the Future Improvement of Society.* His essential idea was that *the human race tends to increase much faster than the food supply.* It was reported in his day that the population of America was doubling every twenty-five years. On this basis 5.3 millions of people in 1800 would have become 10.6 millions in 1825, 21.2 millions in 1850, 42.4 millions in 1875, 84.8 millions in 1900, and 1358.8 millions by the year 2000. The actual population of the United States in 1900 was 76 millions. In 1925 it was 116 millions. It would be 169.8 millions instead if it had kept up its early rate of increase. Most of the falling off in the rate of increase has come in the last 50 years. A large part of the increase at all periods has been due to immigration. Between 1820 and 1910, over 28 million persons emigrated to the United States. Over one million came in the year of 1910 alone. It is no doubt true, however, that the native population would have increased faster if the immigrants had not come. Malthus further stated in his *Essay* in 1798 that

the rate of increase in population was kept in check only by the "positive" restraints of famine, disease and vice. He asserted that the prudential check on the population increase "almost necessarily, although not absolutely, produces vice." The violent criticism which his book received caused him to modify this latter statement in his second edition of his *Essay* in 1802, and recognize that the voluntary restraints might be "moral" restraints, and what is more important, might be adequate to check the population increase.

In this latter form, Malthus' Law of Population is generally accepted to-day. The modern Malthusians, however, place more emphasis upon the "moral" checks and less upon the positive checks, than even Malthus did in his second *Essay*. China illustrates a country in which the positive checks principally operate. Professor E. A. Ross estimates the average age at marriage of Chinese girls as 16 or 17, and of the Chinese men as 20. The parents of the son arrange the marriage, and the young couple live with the son's parents until able to support themselves. The religion of the Chinese makes "posterity" their first obligation. To be without sons is the crowning failure of the individual life. The birth rate under these circumstances is perhaps 45 per thousand,[1] as compared with 19 for France, 29 for Germany and 22 for the United States. In spite of the high birth rate the population of China seems to have remained nearly at a standstill for many centuries. Famine, disease and especially a high infant death rate keep the increase in check. France may be taken as an example of a country in which the "moral" restraints keep the population in check. The average age at marriage in France is nearly 30 for the man and over 26 for the women. Most of the families have two, three or four children. Parents urge their sons not to marry till they can support a family in proper social position. Custom requires the daughter to have a dowry. The population of France in consequence has been nearly at a standstill since 1870. The increase is faster in England, Denmark, Germany and other countries in Europe principally because rapid improvements in production have made such increase possible without a lowering of the standard of living of the people.

The outstanding fact in recent population history is that stand-

[1] Professor Ross makes an estimate of 50 to 60 per thousand in his book, *The Changing Chinese*, pp. 96 ff.

ards of living in all even halfway democratic countries have shown a greater tendency to rise than the population to increase. Most of the modern Malthusians believe that if the time ever comes when an increase in population would cause the per capita production to decline in such countries, and the standard of living to fall, that the increase in population simply would not take place. The desire of every American family for a telephone, furnace-heated home, and an automobile has done far more to check population increase than a per capita decrease in production could ever do. Consequently, so far as the United States, considered by itself, is concerned, most economists are no longer alarmed over the population problem. The modern alarmists are the biologists.[1]

Standard of living is a somewhat confusing term. As used here, it means merely the accustomed level of living. Equally important is what may be called *standard of work*—that is, the accustomed degree of intensity of work, including hours, speed of work, and working conditions. Hence, standards of living and standards of work usually go together. As per capita production rises, more leisure becomes desired in place of more food, clothing and shelter comforts.

It is sometimes said, not very often by economists, that the population is in the last analysis limited by the food supply.[2] Obviously such a statement fails to recognize, first, that the populations of all parts of the earth except those that reached a subsistence centuries ago and have not yet been able to rise above it, will be halted in their increase at a standard of living and of work far above the subsistence level; second, that the present population is fed and clothed in large part out of additional agricultural products made possible by the use of capital goods in the form of machinery, buildings and live stock, and that further improvements in the efficiency of manufacturing production will add still more to the output of food and clothing and hence make possible a still larger population; third, that improvements in transportation and storage have greatly increased the food and clothing

[1] See *Mankind at the Crossroads*, written by Edward East, Professor of Biology at Harvard University.

[2] "Agriculture, not mining or manufacturing, will eventually determine the limits of the world's population." O. E. Baker in *Economic Geography*, Vol. No. 1, p. 50.

supply merely by making it possible to produce more of them under more advantageous physical conditions; and lastly, that since the modern standard of living is made up only partly of subsistence—less than half in the United States—and since the standard of living is as important as per capita production in determining population increase, efficiency in the production of other things—automobiles, furniture, style goods, recreation goods, amusement services, books, etc.—is as important in determining population increase as efficiency in agricultural production. There is far more prospect that Russia and Italy will acquire a standard of living like that of France than that France will lower its standard to that of Russia and Italy.

There is a close relation between the rates of increase of the labor supply, the capital supply, and the land supply. The more rapidly the population increases, other things the same, the less the surplus over present consumption, and the slower the rate of increase of capital goods; likewise the slower the rate of land improvement. A population close to the margin of subsistence will expend its present surplus upon land improvements rather than upon capital goods. A population with a high standard will expand more of it upon increasing the supply of capital goods. The more rapidly that saving takes place, the more rapidly that capital goods will increase; and under such circumstances, capital goods in place of land improvements, will be used to increase production.

3. We are now ready for the third fundamental fact of human existence affecting utilization. *Not only do the amounts of the various elements of production change, but their efficiency and the efficiency with which they are used, are constantly changing.* Improvements in varieties of plants and better cultural methods increase yields per acre. The crop yields of Germany were increased a half between 1885–89 and 1909–13. Introduction of new plants into an area increases production. Improvement in breeding increases live stock production. The average annual production per cow in Denmark is 223 pounds of butterfat; in Minnesota, 165 pounds. New inventions and improvements in the efficiency of familiar types of machinery such as engines, locomotives, automobiles, tractors, shoe machinery, sewing machines, printing presses, add to the volume of production. Every new operation that is successfully reduced to a machine basis means an increasing

roundaboutness of production and increase in output from the same quantity of human and natural resources. By the addition of an amount of saving or postponement of consumption in the form of capital goods to the natural resources and the labor of a country, the output per unit of natural resources and labor can be greatly increased. Improvements in the forms of business organization and in the technique of administration are of no less significance. And probably the increase in the average amount of knowledge and skill possessed by the individual worker has added more to productivity than all else combined. All of the foregoing is usually summed up in the statement that *the volume of production is dependent upon the state of the arts.*

4. *At any given time, or assuming a certain supply of the various elements of production other than labor, and also a certain state of the arts, an increase in the amount of labor used will increase or decrease the output per unit of labor according to the location of the combination on the curve of diminishing physical outputs.* This statement is commonly known as the Social Law of Diminishing Returns. It is also stated in terms of the numbers of the population. But number of people is not a very good index of the supply of labor. An increase in population which does not increase the labor supply cuts down the per capita product in inverse proportion to the increase. It is always an interesting question concerning any region or industry as to the point upon the curve of diminishing returns at which its production is located. Has it reached the point A of highest average output per input of labor? If not, then a mere increase in the number of workers would increase the per capita product. If it is beyond point A, then additional production means a smaller return per unit of labor. It is difficult to see why any people will long use its resources on this side of point A. It would pay them to use less of them and use them more intensively. Yet no doubt the urge to develop a new country rapidly has sometimes led to exactly such a condition. Surely most of the countries of the earth are well beyond point A. Countries like China and Japan are well toward point T. The nearest that they can get to point T is the point at which the curve of output per unit of labor input will exactly provide subsistence for a laborer and permit him exactly to reproduce himself. This means that the family must subsist as well as the worker members in it; but the family needs to be only enough of a family to keep

up the stock. Since resources are never equally divided between the different social classes, the actual average never can be as low as this. Very obviously Malthus' Law of Population assumes the foregoing social law of diminishing returns. It is only because of it that the food supply is incapable of multiplying along with the population.

Obviously a change in the supply of the other elements of production, or in the state of the arts, will change the output per unit of labor. An increase in the supply of capital goods used with the

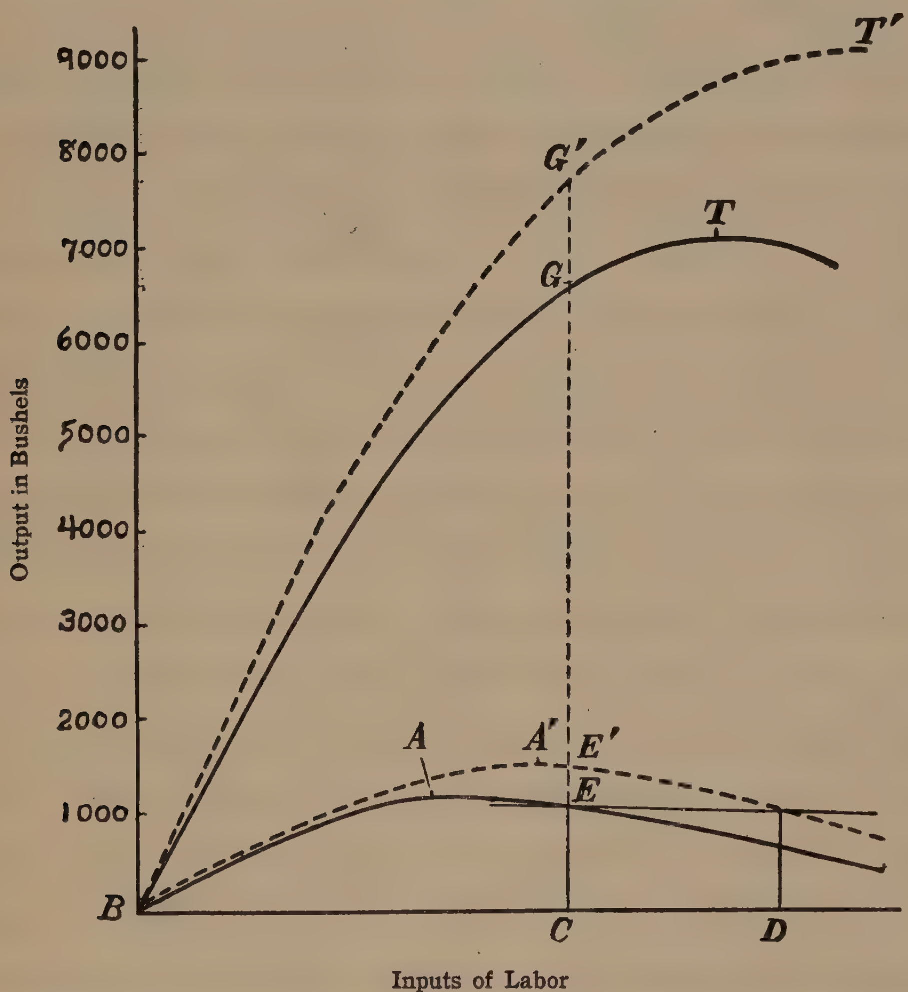


FIG. LXXIV. The Effect of an Increase of Capital Goods upon the Per-Capita Product.

same land, will raise the per capita output. The lower average curve in Figure LXXIV assumes a given amount of land and capital goods and a given state of the arts, and a labor supply, BC, and an output of CE per unit of labor. The total output at G is about 6600 bushels. The upper average curve with A′ for its

high point assumes the same land, but a larger supply of capital goods. The same amount of labor, BC, will give a total output of G′, 7700 bushels, and an average output of CE′. The labor supply (and population) can now increase to BD before the per capita output is as low as before. Any amount of labor between BC and BD will give a per capita output of more than CE.

Any improvement in the state of the arts, such as an improvement in varieties, or cultural methods, or efficiency of machinery would have the same effect as the foregoing; likewise an increase in the land supply.

The foregoing explanation shows two dynamic influences opposing each other, one an increase in population or labor supply, and the other an increase in the capital or land supply, or improvement in the arts. If the population increases so rapidly that these other changes cannot keep up, the per capita product will decline. If it increases less rapidly, so that these other changes more than keep up, the opposite effect will be produced. It seems clear that since 1800 in the United States and in all the newer countries, and in most of western Europe, the population, in spite of its enormous increase, has not kept up with the increase of capital goods and the improvements in the arts, with the result that standards of living have risen. In Russia, the opposite seems to have taken place. Dr. W. I. King came to the conclusion in 1915, after a study of such data as were available, that the quantity of goods per capita in the United States had steadily increased, but that the proportion of it going to wages had decreased since 1900;[1] also that real wages when reduced to a per capita basis had declined.[2] On this latter point it is now evident that either he was mistaken, or that improvements in the arts or the like since have more than made up the ground lost in the earlier period, or that labor is now getting a larger share of the total social dividend. It is doubtful if the per capita product ever really declined in the United States.

II. THE RELATION BETWEEN PRODUCTION AND CONSUMPTION

Production is not an end in itself. It is for the sake of consumption. Nevertheless production is very greatly influenced by consumption. It is therefore necessary to consider in some

[1] *Wealth and Income of the People of the United States*, pp. 169, 177–9.

[2] W. I. King in Appendix to R. T. Ely's *Property and Contract*, Vol. II, p. 844.

detail the relation between production and consumption activity. As the term consumption is used in this textbook, and as it must be strictly defined, it is merely a physiological process. One form of production, namely, *choosing*, is, however, so closely identified with actual consumption that it is usually included as part of the consumption itself. This gives us the division of the field of economics that is now called Consumption Economics. It must be understood, however, whenever this term is so used that it really refers to one of the fields of production economics. The author prefers to use the expression " The Economics of Choice." In this chapter and following, whenever the term consumption is used, it is understood to include *the choosing as well as the physiological process* of actual consumption. The choosing is the significant part of it for our purposes. Following will be enumerated and explained a few of the important relationships between production and consumption so defined.

(1) *The economics of consumption thus understood is almost as important from a social point of view as all the rest of the economics of production.* Nearly everything that is produced is finally consumed. Productive effort may pass into and for a time retain the form of capital goods; but capital goods all in due time pass into final consumption, unless destroyed by fire, flood or hurricane before they get a chance. For any generation the volume of consumption must exactly equal the volume of production, except for the item of *inventory*. If more capital goods, more land improvements, more and better business organizations, a larger stock of durable consumption goods, better governments, better educated and better trained people, are on hand at the end of the generation than before, then to that extent consumption has not equaled production during the period in question. These several inventory items constitute *wealth* in the broad social use of the term. It can therefore be said that production equals consumption, except for any increases or decreases in wealth that take place.

Improving consumption is therefore almost as important from a social point of view as improving production. Improving consumption may be interpreted (a) as reducing the amount that must be produced, and hence providing more leisure, (b) as making it possible to support a larger population from the same quantity of labor and natural resources, (c) as making greater saving possible, and hence the accumulation of more capital goods to aid in further

production, or as (d) making it possible to satisfy more wants from the same income. Thus if a family manages its affairs so as to use less of its income for fuel and rent, it will have more left to spend for better food, or books, or education, or travel. An important use that can be made of left-over income is in self-improvement and education of children. In actual life, the benefits of improvements in consumption work out in all these four ways. Some families work less hard—they raise their standard of work; others raise their standard of living. Some increase the size of their families. Love of children is one of the most powerful of all human wants. Saving increases rapidly with a very little assistance. Most people live in constant fear of poverty in later life.

If one were to write out a list of the ways in which improvements in production work out, it would almost exactly duplicate the foregoing. Improvements in production and improvements in consumption therefore work out to the same social ends. They may be interpreted as substitutes for each other. Effort directed toward one takes the place of effort directed toward the other.

In spite of its very great importance, however, economists have given very little time to consumption. Simon B. Patten of the American economists, and Phillip Wicksteed of the English economists, have probably thought more about it than anybody else. One reason for our backwardness in this field of economics is the smallness of the usual consuming unit. The unit is the household and the individual. Each household and individual makes a large number of decisions. In the aggregate, the chances for error are tremendous; but the probable error in any one decision by any one unit is likely to be very small, absolutely speaking—so small, in the first place, that it is overlooked, and in the second place, that it does not occur to anyone to analyze it. Furthermore, economists thus far, especially in the United States, have been mostly interested in large-scale enterprises, which offer a greater appeal to the imagination. It is obvious that this is an attitude which the public welfare requires to be changed.

The only agencies at present giving much attention to problems of consumption are the departments of Home Economics in our universities. But as a matter of fact, even the work which these are doing is largely concerned with the technique of materials and cooking, dressmaking, millinery and the like, and very little with the economics of making choices.

(2) It follows from the foregoing that *general continued over-production is impossible. The production and consumption of particular commodities may become unbalanced; but not of all commodities*, at least indefinitely. Wheat production was expanded too rapidly during the World War, and it is taking a long time to get it properly adjusted to consumption again. Immediately following the war, the world found itself with large stocks of sugar on hand; in the summer of 1923, a rapidly increasing consumption reduced the stocks of sugar below normal and the price rose rapidly. Petroleum production expanded so rapidly in 1922 and 1923 that by August, 1923, large stocks had accumulated and the prices fell off a third in a few weeks. Such experiences as these point to serious maladjustments between production and consumption of particular commodities; but not to any general over-production. It is always possible also for production to increase more rapidly for a period, because of the opening up of new resources to exploitation, or because of improvements in the arts, than consumption will follow. This difficulty could be resolved simply by using more of the productive energy of society in turning out capital goods. But society does not realize this in time, and the result may be a larger supply of goods for consumption than will be taken by consumers upon terms that will permit production to continue. This may be looked upon as either a maladjustment of production between producers' and consumers' goods, or as a temporary maladjustment of production and consumption.

(3) *Better consumption makes for more efficient production.* Because of an unwise spending of their limited incomes, many of the workers of even prosperous America are undernourished and inefficient. People of large means use their surplus income in ways that greatly impair their efficiency, or that contributes far less to it than using it for self-improvement would.

(4) *If any region will consume the products which it is best adapted to produce, it can support a larger population, or the same population with a larger surplus for buying other things.* Thus the principal foods of the Germans are potatoes, rye and barley, these being crops to which their land is best suited. The French eat wheat rather than rye because their land is well suited to wheat. The southern French and Italians consume large quantities of wine, made from the grapes to which much of their land is better adapted than to almost anything else. The southern Chinese eat rice,

the northern Chinese wheat, and the western Chinese millet, each being the food crop which grows best upon the land of the region. The United States could support a very large population if we could learn to use more corn in our dietaries. The gain from such an arrangement would be partly the saving in transportation, and partly a better utilization of local resources. But against the saving in living cost that would result must be balanced a loss of some variety in the diet; and this very variety is one of the things eagerly sought as incomes increase. Some of this variety is necessary even for proper nourishment. Corn is not a good staple food in the warm climates where it is most freely eaten. But surely the variety which is necessary for health can be provided much more largely from local resources than at present in many American communities. If the population ever does press upon the food supply, this will be one of the places where a saving will take place, and there need be no loss in efficiency of production in consequence.

5. *The individual producing and consuming unit can also be more self-sufficing or less self-sufficing,* that is, produce a large part of what it consumes, or buy a large part of it. The tendency at present is in the latter direction. Fewer housewives are doing their own baking and sewing. They long ago gave up spinning in most parts of the earth. Farmers to-day in the United States are even buying much of their orchard fruit. There are the same possibilities of saving here as in the case of regions or communities, and also the same limitations.

III. CONSERVATION

The natural resources of a country represent a store of commodities which can be drawn upon at different rates. It is possible to use them all in a few hundred years, or to stretch their use out indefinitely, or the richest of them may be exploited the first few centuries and the rest left for posterity. The issue which is involved here is the issue of *conservation.* Presumably a strict definition of the word conservation would make it mean "preservation in an unimpaired condition." Some conservation enthusiasts have carried their notions of proper conservation almost this far. Some have set up for a criterion " the greatest good of the greatest number over the longest period of time." The longest possible period of time is infinity. Divide a coal deposit by infinity

and the result is zero. Dr. L. C. Gray in discussing this point has written as follows: " Conservation as a single principle of action involves the equal importance of future wants and present wants. It requires that the want of the infinitely distant future shall be as important as the want of the immediate present. Conservation as a single principle of action is reduced to an absurdity." [1] The real problem of conservation is the degree to which the present shall be sacrificed for the future. The final answer to this question takes us into the realm of philosophy. What are our obligations to the present generation and to future generations? What is the final goal of society?

While we really cannot give any exact answer to the foregoing questions, we can be certain that the viewpoint is longer than the span of an individual life. The individual thinks much more highly of the present than of the future. He often requires that he be paid before he will postpone present consumption for the sake of the future. Society undoubtedly places a much smaller discount upon the future than do most individuals. Objectives a hundred years hence may weigh almost as heavily in the social balance as immediate objectives.

This difference between the individual's and society's discounts of the future produce a fundamental conflict between the individual and the state. The owner of a forest wishes to secure a rapid turnover of his capital; the state wants to be as well supplied with timber a hundred years hence as now. The mine operator wishes to get his ore to surface with the highest possible net profit. He may therefore leave immense pillars of ore to support the overhanging rock. It reduces his profit less to leave this ore in the mine than to provide artificial supports. The same operator working the same mine a hundred years later might find it very profitable to take out all the ore. To protect the future, therefore, the state may need to step in and impose regulations upon individuals in the present.

Conservation policy is definitely related to capital accumulation and the like. By developing mines and forests more rapidly, capital goods can be created more rapidly. These are not as permanent as the mines and forests would be; nevertheless they continue to yield a product for a long time. A considerable part

[1] *Quarterly Journal of Economics*, May, 1913, p. 515. The article is entitled "The Economic Possibilities of Conservation."

of the great productivity of the United States came from a rapid exploitation of our resources. No doubt this exploitation has been more rapid and more reckless than good social policy can justify. But it must not be forgotten that it has given us our great inventory of capital goods, durable consumption goods, and trained and educated citizenry. With the start that these have given us, we may easily be able to meet the decline in our resources when it comes with improvements that more than offset it. In balancing the future against the present, society must always recognize the probability that the future will bring forth discoveries that will make some resources less needed in the future than now.

IV. WORLD ECONOMY

All of the foregoing social considerations may be viewed from the standpoint of the world as a whole, or from the standpoint of a particular country. From a world viewpoint, the per capita product is reduced whenever any part of it does not organize its production in the way which is best for all. The intensive production of Japan, China, Russia and Italy lowers the average per capita product for the whole world. But the concept of per capita world product has no great significance from the point of view of an individual nation, or even of a particular region. The ratio of labor to the other elements of production in any country or region, and the nature of this labor and of the other elements of production, and of the products which they are used in producing, determine for this country or region what its per capita product will be. Per capita products are much lower in our own South than in our North. The only way in which they can be equalized is for land, labor and capital to move into equal ratios to each other in these two regions, and at the same time acquire equal efficiency and capacity. This will require among many other things a further migration of population from South to North, and of more capital in the opposite direction. The only way for the per capita product of the United States and Italy to be equalized is for Italy to adjust her population to her resources on the same basis as the United States, and for the workers in the two countries to become equally productive inherently. Migration of population from Italy to the United States would go far toward accomplishing this if it was carried far enough and the home

population of Italy did not multiply so fast as to fill up the ranks thinned by emigration.

An important way in which any country or region can increase its per capita product is by producing only those things which it can produce at comparative advantage, and buying all else. Italy could increase its per capita product by buying much of its wheat instead of trying to grow it. A change to this policy would reduce the money income of the wheat growers,—they are being subsidized now—and even reduce the population of the wheat-growing areas; but it would raise the average income of the nation and even increase its population if the standard of living did not rise in place of it. If all parts of the earth followed this policy, it would not only increase the per capita income for each people, but the average for the world as a whole.

The interest which one nation has in the per capita product of other nations arises out of its trade relations with them. If Brazilian coffee planters became more productive, the United States would be able to obtain more coffee in return for the machinery and other products exchanged for it. The high degree of organization of the sugar plantations of Cuba and Hawaii is giving us more sugar in exchange for the goods we are sending them. If tariffs did not interfere with trade, we would be benefiting from the increasing efficiency in production that has been obtained in clothing manufacture in Great Britain. Europe in turn would benefit from our increasing efficiency in the lines in which we have comparative advantage. England, Belgium and Denmark have benefited greatly from the great increase in agricultural productivity in the United States that occurred following the Civil War. France, Italy and Germany might also have so benefited if they had been wise enough to see it.

SUGGESTIONS FOR FURTHER READING

The Foundations of National Prosperity (1917) by R. T. Ely, R. H. Hess, Charles K. Leith and T. N. Carver, treats Conservation in a thoroughgoing manner. L. C. Gray's *Utilization of our Lands for Crops, Pasture and Forests* in the United States Department of Agriculture Yearbook, 1923, pp. 415–506, and W. B. Greeley's *Timber, Mine or Crop?* in the United States Department of Agriculture Yearbook, 1922, pp. 83–180, discuss certain phases of Conservation. A. C. Pigou's *Economics of Welfare* (1924), Part I, contains a careful analysis of certain questions considered in this

chapter. W. I. King's *Wealth and Income of the People of the United States* (1923), Chapters III, VII and IX, discusses conservation and the distribution of income. F. W. Taussig's Chapter 53 is an excellent presentation of the problem of population and labor supply.

PROBLEMS

1. The economists of Adam Smith's day, although primarily interested in social economics, believed that a policy of *laissez faire* was best for the nation. Was this more true at their time than at present? Explain.
2. Why are inventors given monopoly control over their inventions for a period of 17 years in the United States?
3. If you look at the supply of land or capital or total population as output or product, is the manner of increase of each similar? and do they follow the law of diminishing outputs?
4. What is the unit of measurement for the supply of land, labor and capital?
5. Under what conditions may fewer people mean a larger labor supply and more people a smaller labor supply?
6. Economics was once called the "dismal science" and economists were called the pessimists. What was the basis for this?
7. Many people say that there is no social law of diminishing returns and point to the continued increase in per capita goods and services as proof. What arguments would you use to convince persons that such a law is really operative?
8. Is the discovery of a new variety of a crop that yields more product with the same inputs equivalent to more capital or to more land?
9. Could there be general overproduction of material goods?
10. What are some of the economic gains made possible by a larger population?
11. Why is it necessary for society to have a policy of conservation?
12. In what fields of production is conservation most needed?
13. How long a period should the government have in view in determining a conservation policy?
14. Economic progress has largely been associated with an increase in the size of the largely self-sufficing unit beginning with the tribe and village and ending with the nation.
    a. Will this ever expand to a point of world economy?
    b. List some of the tendencies in this direction, and also forces tending to prevent it from happening.
    c. Are there any reasons for believing that the next larger unit will tend to be a continental rather than a world economy?
15. Why does social economics involve more sociology, ethics, religion and philosophy than private economics?

CHAPTER XXXI

THE ECONOMY OF CITIES

The city may be analyzed either as a political unit or as an economic unit. The analysis in this chapter is from the latter viewpoint. An answer will be sought for such questions as, Why have we cities? What functions do they perform? Why are they located where they are? What determines their rate of growth? Some attention will also be given to their important problems of internal organization.

I. REASONS FOR CITIES

The first question to answer is why we have cities at all. Why does the population concentrate into knots? Why does it not spread out evenly over the land? In a purely agricultural country, a condition approaching this may actually exist. For such a condition to exist entirely, each family would have to be an absolutely self-sufficing economic and political unit. If families depend upon the outside for any of their supplies or services, or have a surplus of any of these to dispose of outside, then a market place is sure to develop. A market place need not of itself occasion any concentration of population. It generally did not in the very early villages. The trading parties exchanged with each other directly, and no resident middlemen made a living by assisting in the process. But some of the villages presently grew into " towns " with merchants and shopkeepers. It was convenient to have goods in stock when they were wanted, and to be able to dispose of produce at once and in large lots when it was ready for market. It was also convenient to be able to buy the services of weavers, tailors, shoemakers and blacksmiths all in one place. The shopkeepers found it advantageous to be located near the merchants, and the merchants near the shopkeepers. Even the workers on the land crowded as close to the villages and towns as they could in most regions; but there were no doubt additional reasons for this. As exchange broadened out to include more foreign trade, more and more families resided in cities and made their living from commerce. In due time wholesaling was added

to retailing. Cities needed to be of considerable size before they could furnish volume of business enough to provide a livelihood for many wholesalers. The economies of wholesaling where it could be practiced, however, became a reason for the further growth of favored cities. The improvements in transportation in the nineteenth century magnified many times the foregoing tendencies. To the middleman group, itself greatly increased in numbers both absolutely and relatively, was added presently a transportation group which mostly lived in the cities. To both were added the somewhat smaller group of bankers who assisted in the financing of exchange. The first great reason for concentration of population in cities is therefore commerce or exchange.

Cities seem in part to grow upon their own substance. Every new family that is added to a city to assist in its exchange activities adds a little to the need for the services of doctors, lawyers, teachers, bankers, public officials, tailors, carpenters and plumbers—and even of other middlemen. Many modern cities are nearly as much engaged in furnishing exchange and services for their own residents as they are for people in the region surrounding them. Cities therefore grow almost by multiplication.

No doubt certain social advantages of concentration have been a factor in it. First of all, the early peoples lived in fortified villages and walled towns so that they might coöperate in military defense. Many a European city owes its present street plan to the course followed by its city walls in the Middle Ages. In a later period, the advantages of numbers in organizing education, recreation, sanitation, police protection and the like became more important than military defense. Social intercourse itself improves with numbers up to a certain point. Only large groups can maintain theaters and amusement parks. If small groups provide them, they are of poor quality.

Military defense was so absolute a need in the Middle Ages and earlier that no doubt people would have concentrated to secure it even at great economic loss. But this can hardly be true of recreation and the other social advantages named. These would have been able to assist in the urbanization process only a little were it not for the fact that the civilized world has always had a leisured class, either in the form of an aristocracy living upon income and privileges bestowed by the ruling powers, or inherited from an-

cestors who won them by conquest, or in the form of a well-to-do class living upon their earlier earnings or upon inherited wealth. The leisured class has generally found the cities the pleasantest places in which to live. Its wealth has been of great assistance to the cities in providing education, recreation and other social advantages, and has made the city even more attractive than it otherwise would have been. All cities of any size are therefore made up in part of people who are merely living in them. Even the country town has its retired farmer class. Los Angeles, California, Atlantic City, New Jersey, and Miami, Florida, are examples of cities which are largely residential. The natural advantages of a city attract people of leisure, and then social advantages are added to the natural advantages. There is no necessary reason why the surplus-receiving members of society shall live in the city. A few of them always prefer to live in the country. The time may come when more of them will so prefer. But for the present the pleasures which the city affords seem to weigh more heavily in the scale of satisfactions than the cleaner air and purer sunlight of the country. Some of the comforts of living, such as furnace heat, hot water, electric lighting and gas, are provided more cheaply in the city than in the country. For the most part, those who take great delight in living close to nature satisfy their want for this by maintaining a summer home, or by taking a summer or a winter vacation.

Most of the early cities were capital cities and owed their size in large part to the officials and employees of the government. The governing classes gathered in the principal cities and exacted taxes in kind upon the provinces. They were thus able to set up large establishments of slaves or retainers or soldiers. The size of such a city depended upon the amount of tribute that could be exacted. Early London was such a city; and Paris as late as the reign of Louis XIV. For centuries, the population of Rome was largely fed on wheat transported from Egypt. In the later period, the population of Rome was sometimes close to famine for weeks at a time. Government is still administered from cities. It is more efficient if administered from a central point. But only a few cities are purely governmental in their activity. The Hague comes as near to it as any modern city.

Religious worship has been a cause of concentration of population in a few cases, Delphi, Mecca, Jerusalem and Rome being

the outstanding examples. In modern society, the churches are nearly all in cities.

Not all of the foregoing, however, could have given us the degree of urban concentration which we now have. The great maker of modern cities is not commerce, or any of the other factors mentioned, but industry. The principal growth of our present large cities has come since the Industrial Revolution. We speak of New York as a commercial city, and yet the factory employees in the New York area increased 83.6 per cent between 1900 and 1922 while the population of the area increased only 66.8 per cent.[1] The same influence has reached down into the smaller cities all over the country. Few cities of two or three thousand inhabitants do not have a factory or two. Industry causes population to concentrate because, first, one factory may employ many workers, and second, because different factories tend to locate at one place, partly in order to complement each other as to supplies and products, partly in order to dovetail with each other in the use of labor, and partly because of the advantages probably offered by the location for one type of factory. The economies of large-scale factory production are causing ever-increasing urban concentration. The industrial growth of a city also adds greatly to its commercial, financial and transportation activity. Raw material and supplies must be brought into the city and the finished product sold and transported. The factory workers' families must be fed, clothed, entertained and educated.

Mining towns, in contrast with manufacturing centers, are likely to have no commerce other than such as is necessary to provide for the mine workers. The only factories usually found in mining areas are smelteries and refineries. Exception to this occurs in the case of some eastern mining areas in which textile industries have developed which make use of the labor of the women.

What is a City? The foregoing raises the question as to what is a city. Some define a city in such a way as to exclude mining communities no matter how large. If the almost purely agricultural villages of Russia, Italy, or Japan, sometimes with several thousand inhabitants, are not called cities, and few call them such, why should mining towns be so classified? According to

[1] R. M. Haig, "Towards an Understanding of the Metropolis," *Quarterly Journal of Economics,* Feb., 1926, p. 190.

this distinction, no population group no matter how concentrated is a city if it is engaged only in extractive production.

Professor E. A. Ross even goes so far as to call Pittsburgh and Scranton only " part cities," because the capitalists who own and direct their major enterprises mostly live somewhere else. The profits of these enterprises are mostly consumed in New York and Philadelphia. To these capitalists, Pittsburgh and Scranton are merely " estates in the country " which provide them with their living.

It must be admitted that cities of this kind can scarcely be called *complete* cities. Neither are the largely residential cities, or largely governmental cities. Even a certain amount of industry is probably necessary to make a complete modern city. At least, a city which does not manufacture its own bread and ice cream, launder its own clothes, and provide its own heat and lighting, will hardly be called complete. But it does not seem wise to set up any particular type of economic activity as necessary to the concept of a city. In this chapter, any considerable concentration of the population will be called a city regardless of how or where this population earns its living, unless it is a purely agricultural population, such as found in many European and Asiatic villages.

II. HOW LARGE A PART OF THE POPULATION CAN LIVE IN CITIES

Only 26.3 per cent of the gainfully employed persons of the United States work on farms, and yet the nation is agriculturally self-sufficient. The value of agricultural imports and agricultural exports about balance at present. It is interesting to compare this figure with a similar figure for other countries in Table LVI. Only three countries, Belgium, England and Australia, have a smaller percentage of their workers engaged in agriculture. Belgium produces only 60 per cent of its food supply, and the United Kingdom only half of its food supply. Germany with 35 per cent of its workers engaged in agriculture produced only 90 per cent of its food supply before the War, and France only 93 per cent of it. The United States is able to produce all its agricultural products with so few workers, partly because it has a large area of relatively fertile agricultural land per capita, and partly because its workers use so much horse-labor and farm machinery. Australia, a still newer country than the United States, shows the same effects in even more pronounced form. In the countries

with greater density of population, the work on farms is much more largely done by hand, and many more farm workers are needed per capita of the total population.[1]

TABLE LVI. PECENTAGE OF POPULATION URBAN, AND PERCENTAGE GAINFULLY EMPLOYED IN AGRICULTURE*

	Population per square mile	*Percentage urban*	*Percentage gainfully employed in agriculture*
Belgium	636	44	22
England and Wales	649	78	7
Japan (proper)	395	40 †	—
Italy	329	40 †	55
Germany	328	65	35
Switzerland	243	25	26
Denmark	192	41	44
France	184	46	41
India (total)	177	11	71
Ireland (old)	134	34	43
China	102	25 †	—
United States	35	51	26
Sweden	34	26	40
South Africa	15	25	59
Australia	2	63	22

* From a study made by Carl R. Arnold under direction of the author. Data are for the nearest census year.
† Estimates based on scanty information.

The more machinery that is used on farms, the more workers who must live in cities and make it. Also the higher the standard of living of a people, the larger the percentage of the income that is spent for goods of the sort that are manufactured in the city. These are two additional reasons that so few people relatively live on farms in countries such as the United States and Australia.

What will happen in the future? Most economists believe that the percentage of agricultural workers in the United States will still further decline. How far will it continue? This depends upon the relative efficiency in the future of our agricultural and

[1] There appears at first to be a discrepancy in the data in Table LVI. If only 78 per cent of the population of England and Wales is urban, then 22 per cent must be rural. But only 7 per cent are reported as engaged in agriculture. The principal reason for this difference is that many people in England and Wales live in the country, but work in adjoining cities or mines. This is almost equally true in Belgium, Germany and other countries on the continent. On the other hand, in southern Italy and some other portions of the continent, many farm families live in small cities and travel to and from their farms daily.

urban production. If our manufacturing maintains the advantage which it now enjoys in many lines over foreign manufacturing, our cities will keep on growing faster than the country. Efficiency in agriculture has two opposing effects on rural population; on the one hand, it reduces the number of workers required, and on the other, it enables the agriculture of a nation to compete more successfully with foreign agriculture. The net effect in most cases is to reduce the number of agricultural workers relatively. It is therefore entirely reasonable to expect the percentage of agricultural workers to decline from 26.3 per cent to 20 per cent. If cotton and corn are ever harvested successfully by machinery, the percentage will decline even under 20 per cent. And this without importing a larger percentage of our agricultural products than at present. If we were to become a food-deficit nation, the percentage could decline even to England's 7 per cent. But there is little chance that the United States will ever be a large food-importing nation. It has too large a proportion of the fertile land of the earth within its borders for that.

Changes of the same sort as the foregoing are taking place in other parts of the world. Even in Europe, farm machinery has been replacing hand labor. The city-ward trend has been almost as pronounced in Denmark as in the United States during the past 50 years. But obviously it will not be possible to support the dense populations of most of these countries without supplementing machinery with a great deal of hand labor. In general, only an increase in efficiency of production faster than the increase in population can make possible a rapid urbanization. Any country rich in coal and iron which is content to import its food, will find its cities growing rapidly.

III. REASONS FOR LOCATION OF CITIES

The reasons for the original location of a city and the reasons for its later growth are sometimes the same and sometimes very different. Pittsburgh was started as Fort Pitt at the junction of the Allegheny and Monongohela Rivers. Whatever happened, it was bound to be a city of importance. If water traffic was to grow in volume, it stood at the head of the great Ohio-Mississippi system. Highway or rail traffic was sure to pass through it because it stood in one of the great passes in the Allegheny Mountains. But it would never have been the city that it is if coal had not been

discovered in its vicinity, and iron in the Lake Superior district, and if Philadelphia had not developed directly east of it.

If a poll were made of the actual reasons for first location of the notable cities of the world, the count would probably run about as follows:

1. Head of navigation.
2. Good harbor.
3. Military defensibility.
4. Junction of rivers (may be the same as No. 1).
5. Passes in mountain ranges.
6. Fords in rivers.
7. Junction of trails or trails and water routes (may be same as No. 5 or No. 6).
8. Healthful location.

Most of these need no illustrating. Edinburgh, Quebec and Rome are examples of cities established for military advantage. Warsaw in Poland is located at the head of navigation on the Vistula River. Moscow is situated upon a minor river; but on a large fertile plain, even a minor advantage may give a city its start. Constantinople was located at the junction of the north-south route between Russia and the Mediterranean with the Europe-to-India-and-China caravan route. Milan in Italy is situated at a junction of the Po River with one of its branches, and connects conveniently with passes through the mountains. Denver started at a junction point of mountain trails. Salamanca in Spain was started at a ford on the Tormes River. Then the Romans built a bridge over the river. This gave further advantage to the location, and it became a point on the line of travel between Madrid and France—later followed by the railroads.

IV. THE DIFFERENTIATION OF CITIES

Cities have become differentiated since they started both as to type of economic activity predominating and as to size. The chapter on the historical background of modern production showed how certain villages acquired merchants and became towns while the rest remained as before. In these towns, the handicrafts developed, at first only to meet local needs, later for outside markets. The merchandising function presently split into wholesaling and retailing phases. At this stage, some of the towns be-

came more commercial than the others and were called cities. They engaged in foreign commerce and did the wholesaling for other towns, which remained much as before, or perhaps became more industrial. The towns which became commercial had strategic location with respect to transportation. Other towns had equally valuable industrial advantages, being near to sources of raw materials. The Industrial Revolution and the improvement of transportation accentuated all these differences. When these had done their work, there was no mistaking the results. Some great cities, like Manchester, Sheffield and Leeds in England, and Pittsburgh, Cleveland and Chicago in the United States, had developed along predominantly industrial lines. Others, like London, Amsterdam, New York and New Orleans, had continued their commercial development. No cities were entirely industrial or entirely commercial. The most industrial of them were doing merchandising for some sort of a trade area. The most commercial of them had at least a few local industries. At the same time, the special types of cities, such as mining cities and residential cities, had become more clearly marked.

The commercial cities also became differentiated among themselves. Between the central market city and the local market, the secondary wholesale or jobbing market had appeared. This made it possible for central market cities to become more nearly *market places*, with facilities for large-scale brokerage transactions. The larger the commercial city and the more strategic its location, the more of a market place it became, and the larger the proportion of its transactions that were of the brokerage type. The differentiation included money and securities as well as commodities, with the difference that the wholesaling was more confined to the larger cities.

The accompanying differentiation in size was a true differentiation. It not only gave us a much wider range between the smallest and the largest, but also a full assortment of all sizes between. Here is the place to consider the question as to why some cities grew rapidly and some slowly. This raises the whole question as to competition between cities. The commercial importance of a city depends upon its market area. In the last analysis, two things determine the division of area between markets, namely, relative prices in the different markets, and relative transportation costs. As between competing markets, the one with the higher buying prices

will claim the more of the intervening territory, unless freight rates are enough lower to the other market to fully offset the price advantage. This is illustrated by Figure LXXV following. With prices at $1.00 in markets A and B, and freight rates the same, the areas will meet at point X, where prices will be $.94 per bushel; but if the price should rise to $1.02 in Market B, freight rates remaining the same, Point O will become the boundary line, with the price at $.95 per bushel. If the freight rates to A should be doubled, prices remaining the same, and likewise freight rates to

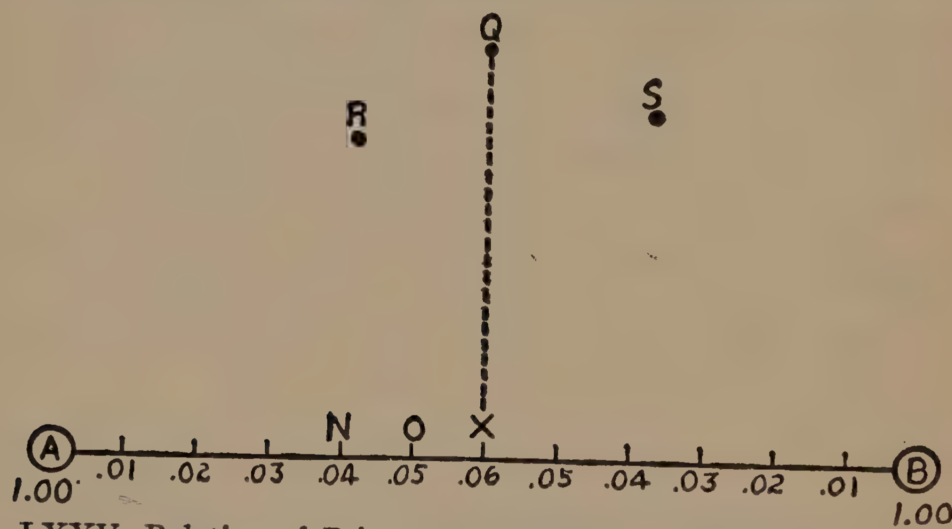


FIG. LXXV. Relation of Prices and Freights to Market Areas for Points in a Direct Line.

B, the boundary line would be at Point N, with prices at $.92 per bushel. This might not, however, give Market A enough of the product for its local needs, in which case prices would rise in Market A enough to overcome the freight increase. If prices rose to $1.03 in Market A, then O would become the boundary line.

How about Points Q, R and S, not on a direct line between the two markets? With prices and freight rates the same, the boundary line will be the straight line including Point X. Prices at Point Q will of course be lower than at Point X because it is farther from the two markets. If prices at B rise 2 cents over those in Market A, the boundary line will shift toward Market A, but will not be a straight line at right angle to the line connecting A and B. It will be instead the curved line OP indicated in Figure LXXVI below.[1] Every point on this curved line OP is 2 cents nearer A

[1] Professor Frank A. Fetter presented a similar analysis of this problem in his article, "The Economic Law of Market Areas," in the *Quarterly Journal of Economics* May, 1924.

than B, the same as is Point O. It takes a curved line to fulfill this condition. In mathematics, this curved line is known as an *hyperbola*, and is described as a line such that the difference of the distances from any point in it to two fixed points, called *foci*, is the same. The distances to Markets A and B are of course greater as one goes above or below O, but the differences between them are constant. With prices at $1.02 per bushel in Market B, and $1.00 per bushel in Market A, the price at T will be $.95 per bushel; at U, $.94 per bushel. If this did not give A enough of the product,

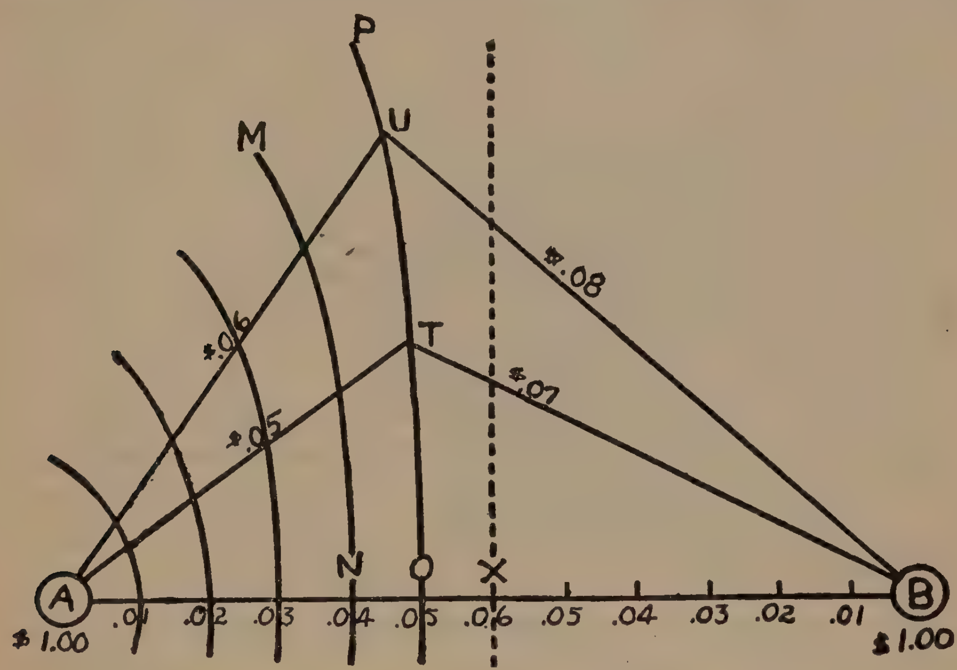


FIG. LXXVI. Relation of Prices and Freights to Market Areas for Points not in a Direct Line.

prices might rise there and shift the boundary to a new curved line a little farther from A.

The curve MN represents the boundary line with prices 4 cents higher at B than at A; the next curve, the boundary line with a difference of 6 cents between the two markets. With the differential between these markets high enough, B would get all the product except that in a direct line to the left of A.

Differences in freight rates would introduce no factors not already explained. Doubling freight rates to A would shift the boundary line to a curve nearer A.

The analysis thus far rather assumes two markets buying only for local consumption. Suppose a surplus is produced in the area which is merely forwarded to some large consuming center C a

thousand miles directly east of B. Under these circumstances, shipping through B to C would be the shortest route for all produce except that directly behind A, and assuming freight rates proportional to distance, B would get all the surplus from the area. Market A would get the produce directly behind it, and enough above and below this line to meet its local needs. Theoretically, every point on the direct line between A and B would ship to B.

But why ship to B at all? Why not ship direct to C? If freight rates were strictly proportional to distance, and railroad lines could always be laid out so as to connect points in the shortest

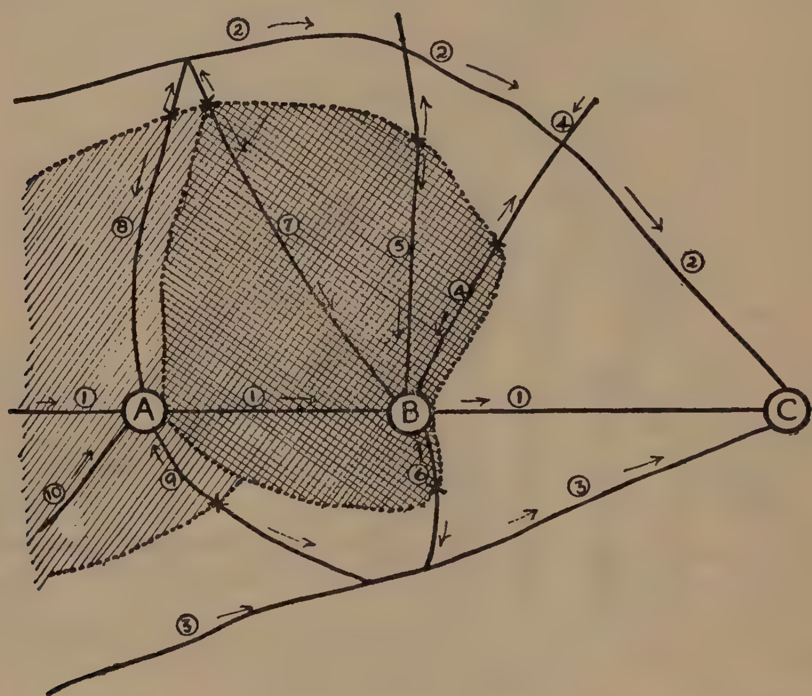


FIG. LXXVII. Effect of Railway Lines on Market Areas.

line, the only produce which B would get would be that which it needed for its own consumption. As it is, railroads are likely to be laid out to pass through B for considerable of the surrounding territory, and the produce from this territory will follow these lines. Railroads have to connect with B to haul locally consumed produce of various kinds, and also passengers, and it is more economical to use these lines for the surplus produce of the area than to build special lines for it. Hence B may be a concentration and forwarding point for considerable of the surplus produce of the area. And the same will likely be true for Market A. Figure LXXVII illustrates conditions more nearly as they are. The produce within the two circles will be concentrated at B and at A,

because taking the railroad lines as they are, this is a shorter route to Market C than over lines 2 and 3. The arrows indicate the direction and lines which the produce would probably take, and the crosses indicate the dividing points. Thus produce along line 7 will go to B first, except a little just this side of the junction point with line 2.

Another reason that most produce is concentrated at A and B instead of being shipped directly to C is that much of the produce loaded at local stations is in small lots, and needs to be assembled into carlots at some central point before being forwarded to C. In many cases it needs to be sorted and graded in addition, and perhaps packed or repacked. Sometimes it is more economical to store produce for a time in market centers like A and B than at large consuming centers like C. Then finally it is generally advantageous to do the processing at points like A and B. There are several reasons for this. The first is that freight costs on processed goods are generally less than upon unprocessed goods, because of the reduction in weight and bulk that accompanies the processing. Dressed carcasses and cured meats are shipped more cheaply than live stock on the hoof. A second reason is that the by-products may be needed more in the original producing area or near it than near the great consuming centers. A third reason is that some produce is perishable and needs to be processed before being shipped long distances. Lastly, some of the produce needs to be processed for local consumption anyway, and this gives the local processers an advantage over competitors in the large consuming centers. Sources of power, fuel and other supplies also become a factor in the problem.

It will be interesting to note the price structure in such a situation. For any produce shipped over lines 1, 2 or 3, the local price will be the price at C less the transportation and handling costs. This will be true of the prices at the dividing points, marked with crosses, on lines 4, 5, 6, 7, 8 and 9. Prices at points nearer B than these dividing points will be based on the prices at C, less transportation and handling costs over line 1 combined with those over lines 4, 5, 6 or 7 respectively, including handling costs in Market B. The difference between the prices in B and in C will tend to equal the transportation and handling costs over line 1 between the two points. If the price fell below this point in Market B, the dividing points on the several lines would be drawn in nearer

to B, and more produce would be shipped directly to C over lines 2 and 3, until the price at B was brought back into line again. Likewise the prices at A and B would differ by the transportation costs between A and B. As long as A and B were both handling more than needed for local consumption, the price differential between them could not remain permanently either more or less than the difference in transportation rates to the two points from C.

The foregoing assumes that the produce is merely being forwarded through A and B with no assembling or processing. If carlots can be assembled at A and B and not at any points on lines 2 and 3, then the differential between B and C will tend to be the

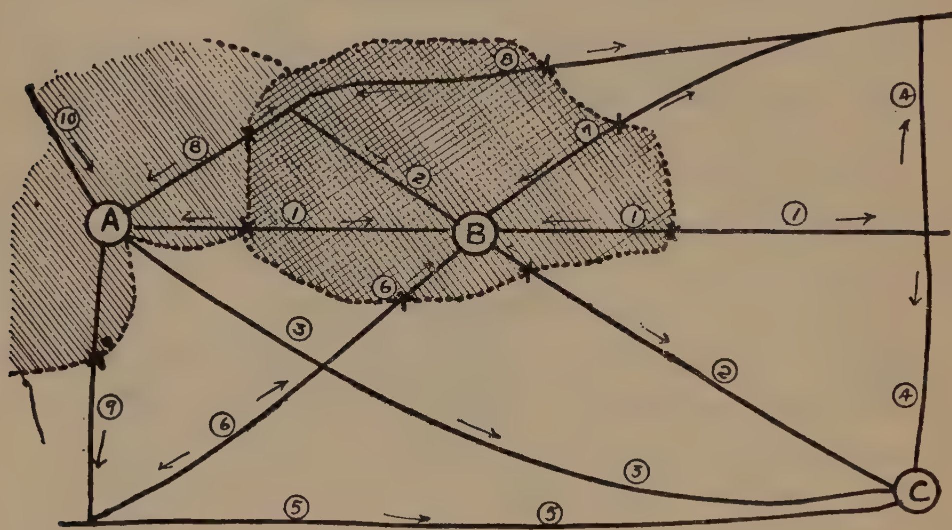


Fig. LXXVIII. Effect of Railway Lines on Market Areas as Affected by the Position of Consuming Areas.

carlot transportation rate. Similarly, if the product is processed at A and B, the differentials between C and B, and C and A, will tend to represent only the transportation and handling cost of the product after it is processed. Demand for by-products in the different markets may also be a factor in determining relative prices. If Market A is nearer to consumers of the by-products, this will offset some of the extra transportation costs of the main product to C.

A modified form of the foregoing analysis applies to a situation in which Market C is not directly east of B, but somewhat to the south or north of it, as in Figure LXXVIII following. The market areas of A and B will be reduced on the southern side, but extended somewhat to the north. The exact effect will of course depend upon the particular layout of the railroads.

In this case, the price differential between B and C will be the transportation cost between these two points along line 2, either in small lots or carlots, or processed or unprocessed, as the case may be; and the price differential between A and C will be the transportation cost between A and C over line 3. The price differential between A and B will be the difference between the rates for A to C and B to C, which will be something less than the rates from A to B. Prices may occasionally get out of line in A and B, especially if they have processing plants requiring a regular supply of produce in order to operate economically, but they will not stay out of line long. If the prices get very far out of line, produce may actually be shipped from A to B, or even from B to A. A situation something like this maintains between Minneapolis–St. Paul and Chicago. In the territory which lies to the south of A and B, prices will ordinarily be so high that no produce will be shipped to A and B—prices will be those of C, less transportation costs direct to C. But occasionally prices in B may get out of line enough above C to warrant shipping to B. Or prices may get so low at B as to cause more than the usual amount of forwarding to C.

A situation somewhat related to the foregoing arises if a consuming area such as Europe reaches out into the same general territory over different routes with different transportation costs. In such a case one market center, such as Duluth, may serve as a concentration and processing point for one route, and another one, such as the Twin Cities, may serve as a concentration and processing point for the other route. Transportation costs over the two routes will determine the boundary line between Duluth and the Twin Cities.

Sometimes the two routes supply competing consuming areas. Thus produce from Iowa and Illinois may either go to New York over one route or to Baltimore over another. In this case prices in the two consuming areas as well as transportation costs help determine the boundary line of market areas.

But prices and transportation and handling costs are after all only the immediate determinants of market areas; the real causes are beyond. Transportation costs are influenced by the kinds of transportation available, whether by water or by rail, by the course and direction of navigable lakes and rivers, by the topography of the country in so far as it determines the layout of railroads, and

by the location of the producing areas relative to markets, harbors and transportation routes. Prices are influenced by the volume and density of production in the market areas, by the volume of local consumption within the area, and in the market center, and by the volume of consumption in outside consuming areas; also by any factors which will determine where assembling and processing operations are most economically performed.

The Minneapolis-St. Paul Market Area Taken as an Example.—The foregoing principles relating to market areas may be illustrated by taking the Minneapolis-St. Paul market area as an example. The fundamental geographical considerations which are to-day maintaining the Twin Cities as an important market center are the large area of agricultural land to the west and northwest, and the railroad lines already built which pass through them on their way to Chicago and the East. The area to the west and northwest—the "hinterland" of the Twin Cities—is a great surplus region for farm products, and the consumers of this surplus are mostly in the eastern part of the United States and in Europe. The surplus is therefore eastward bound; it is eastward bound from as far west as the Rocky Mountains—roughly speaking, to about Great Falls, Montana. Beyond this point it is better to ship to the East by way of the Panama Canal, or to find a market somewhere on the shores of the Pacific. All traffic to the East from the northwest region must go over the Canadian Pacific north of Lake Superior, or over the Great Lakes, or just south of Lake Superior through Sault Sainte Marie over the "Soo" railroad; or it must pass through Chicago and around the southern end of Lake Michigan. The Canadian Pacific route is too far north for much of this area. Moreover, its eastern terminals connect much better with export outlets than with New York City and our populous East. Even as an export route, it is closed beyond Montreal from about December 1st to May 1st. The Great Lakes route is also closed for the same period. Finally, an examination of the map will show that for a very large part of this surplus area, Chicago is more nearly on a direct line with Cincinnati, Detroit, Cleveland, Pittsburgh, New York, Philadelphia, Baltimore, Washington, Norfolk, Charleston, and the whole block of populous territory included within this circle, than are any points north of Lake Michigan. Furthermore, if a series of straight lines are drawn through these points and Chicago and westward, Minneapolis and St. Paul will be found to

be situated very close to many of these lines. It will be true particularly for the lines reaching into a good part of central and western Minnesota, into North Dakota, and Montana, and into the Canadian Provinces of Alberta and Saskatchewan. Moreover, the Twin Cities have their connection north of Lake Michigan through Sault Sainte Marie. It is no accident, therefore, that several great railway lines, particularly the Northern Pacific, the Great Northern, and the Chicago, Milwaukee and St. Paul, pass through the Twin Cities. If the whole of our present civilization in this area were to be wiped out and start over again, these same railway lines would probably be built about where they are now.

This would not be true, however, of all the railroads. Some of them were built to the Twin Cities because the Twin Cities were already established. Some were probably built out of their course so as to include the Twin Cities. The first growth at this point came because here was a junction of the St. Croix, Minnesota and Upper Mississippi Rivers, making it a convenient trading point in the days of the fur harvest. With the coming of the river steamboats, these trading posts marked the head of navigation on the Mississippi. Even when the steamboats began to operate in the upper Mississippi, the Minnesota and the St. Croix, goods had to be carried around the St. Anthony Falls. When lumbering began, the three rivers fed their logs to the sawmills that began to use the water power of the Falls. Then came wheat growing and the great mills that used the water power of the Falls to still greater advantage. The steamboat traffic was the great builder of the Twin Cities before 1860. After this for a while the water power at the Falls, using the supply of lumber and wheat on the hinterland, was the principal factor in their growth. The railroads came to the Twin Cities, as already explained, partly because they could not go anywhere else, and partly because here were two thriving cities which they must surely tap or include in their routes to the East. Hence in the third period the railroads became the great builders of the Twin Cities. They reached out and opened up the great hinterland, and brought its products to the Twin Cities to be processed and distributed over the East. At the same time they became the distributing point for the supplies and merchandise needed by the people who grew the wheat. And with this development came factories to make the machinery needed for growing the wheat. To-day their rivers mean little to the Twin Cities except

for their water power, and even the water power is constantly lessening in relative importance. The railroads now furnish the basis for most of the growth of the two cities.

But actual hauling distance is one thing, and actual freight costs is another. The power of the Interstate Commerce Commission and the various state railroad commissions to determine the reasonableness of rates, puts them in a position to expand or contract almost any market area. They may by a slight change in the schedules cause much live stock to go to Chicago that now goes to South St. Paul, or vice versa. Their general policy is to determine the most economical route, and to make rates such that produce will be shipped over it. This means assigning certain territory definitely to one market or another. But there are many difficulties in following out such a policy, and many times does it have to be qualified.

The territory to the north which is most out of line with the Twin Cities is that directly north and northeast of them in northern Minnesota and Canada, which finds its outlet by way of Duluth, Fort William, and the Great Lakes. In fact, for export trade, the market area of Duluth reaches clear across Minnesota and into the Dakotas. It is also to be noted that the iron ore and lumber of this region are mostly handled over the Great Lakes route.

Figure LXXIX shows the territory actually included in the Twin Cities market area for agricultural products. The areas for grain and live stock reach clear to the Rocky Mountains. Competing points for grain are Chicago, Duluth and Seattle. The export types of grain from all of this area, particularly the durum wheat and the rye, are shipped by way of Duluth. Competing markets for live stock are Chicago, Milwaukee, Omaha and Sioux City, Iowa, and several small packing plants scattered over the area. Only an occasional carload of western potatoes reaches the Twin Cities. The hay area is restricted by the fact that very little surplus is produced. Much of the butter from the area is shipped to the East and is merely assembled in the Twin Cities, Duluth or Chicago. The fluid milk market area has a radius of less than forty miles. The local fruit and vegetable area is still smaller.

The principal competition of the Twin Cities in jobbing is with Chicago and Duluth. All over the area, however, are small jobbing centers which have carved out certain territory for themselves in

which they handle a greater or lesser proportion of the jobbing trade. It is illuminating merely to name these small centers: Ashland and Superior in Wisconsin; Red Wing, Rochester, Albert Lea, Mankato, Bemidji, Crookston and Moorhead in Minnesota; Aberdeen, Mitchell and Sioux Falls in South Dakota; Grand Forks,

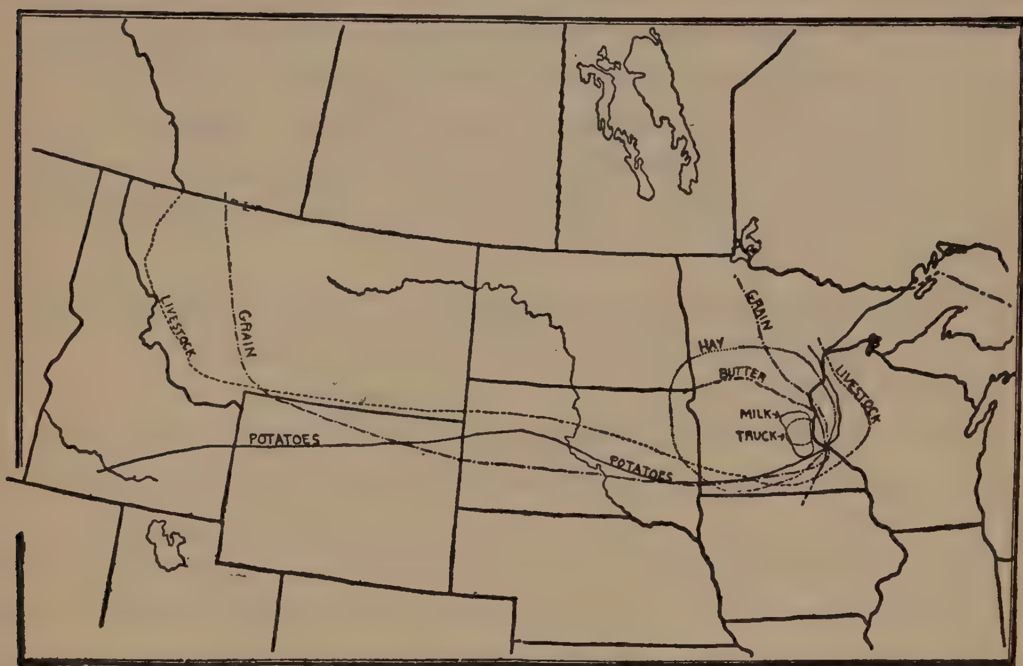


Fig. LXXIX. The Twin Cities Market Area for Agricultural Products.

Fargo, Bismarck and Minot in North Dakota; and Miles City, Billings, Great Falls, Helena and Missoula in Montana.

Industrial Competition.—The Twin Cities happen to be a city group whose growth is based largely upon competition for agricultural products. If a city had been taken which had a supply of coal or iron within reach, such as either Cleveland or Pittsburgh, the same issues would develop. If coal and iron are produced in exactly the same territory, the city which will develop most rapidly will be the one within it or upon the edge of it which has the best transportation connections with the outside market for iron and steel and their products. If the coal and iron are situated apart from each other, the city which will prosper will be located at some break in transportation between the coal and iron. If both coal and iron have to be transported by the same means, the city will probably be nearer the iron than the coal, because it takes 2 tons of ordinary iron ore as against only 1.3 tons of coal to make a ton of pig iron. If the iron ore can be transported by water, and

the coal has to be hauled by rail, it will tend to be nearer the coal, and at the break in transportation between. This accounts for the growing industrial importance of Cleveland. If the market for the product is nearer the iron ore, this may shift the manufacturing center nearer the iron. This accounts for the industrial growth of Gary, Indiana and a large part of the industrial importance of Chicago and Milwaukee. If it were possible to transport coal cheaply in barges from the Illinois coal fields to the Twin Cities, some of the iron and steel products industry would shift still further west. If the next cheap source of iron ore to be tapped is Brazil or Newfoundland, then the eastern cities will continue in easy supremacy.

Manufacturing industries using imported raw materials, such as wool, hides, flax seed and rubber, will continue to be located principally in seaboard cities.

Competition Between American Cities.[1]—The first competition to develop in North America was between British New York and French Montreal and later New Orleans. The competition of New York and Montreal was for the fur trade of New England and the grain of western New York. When the building of the Erie Canal gave New York the supremacy, Canada countered by digging the Welland Canal around the falls. To-day the issue has broken out afresh: New York is opposing the deepening of the St. Lawrence waterway and central and western Canada are working for it. New York has a much larger hinterland than Montreal, and an open harbor in the winter. Notwithstanding these facts, Montreal is the second port in North America.

In the period from 1820 to 1860, New Orleans rivaled New York closely as an export market, drawing farm products by steamboat and raft from the rich Mississippi River Valley. The building of the railroads turned much of this traffic eastward, where it has since remained. It was expected that the building of the Panama Canal would revive New Orleans, but thus far these expectations have not been realized.

In the meantime the two great interior cities, Chicago and St. Louis, had developed, competing not only with New York, Montreal and New Orleans, but with each other. In the early period, the location of Chicago on the Great Lakes and of St. Louis on

[1] This account follows closely that of Professor N. S. B. Gras in Chapter VI of his *Introduction to Economic History*.

the Mississippi made these cities wholesaling and jobbing centers for territory farther inland and caused such industries as flour milling, meat packing and sawmilling to make a beginning. Later development made each of them the center of a great network of railroads. This first broadened out the jobbing areas around them, and then brought great manufacturing industries to them, especially to Chicago. Chicago never will become a New York, unless the opening of the St. Lawrence waterway produces unexpected results. Chicago will always be subordinate to New York in financial affairs and will look to New York as its connecting link with the outside world. This will be even more true of St. Louis.

Still farther into the hinterland of New York and New Orleans, the Twin Cities and Kansas City have developed, first transforming from mere retail trading posts to jobbing centers, and then to central market and wholesaling centers. They are even more dependent upon New York than are Chicago and St. Louis. Their competition with each other is principally in flour milling.

San Francisco and Seattle on the Pacific coast have hinterlands of their own which can never be interpreted as being included in New York's hinterland, except possibly in a mild financial sense. Seattle is still tributary to San Francisco financially and in some other respects.

On the Atlantic coast, Boston, Philadelphia and Baltimore have competed with New York for the trade of the hinterland and have secured no small part of it. Boston is the commercial center for most of New England, and by its rail connections with Albany and Lake Erie has maintained some direct trade connections with the central states. Many of its manufacturers " go around " New York and deal directly with buyers' or sellers' representatives in western and southern markets. Baltimore has the lowest rail rates to Chicago of the four coast cities mentioned, and Philadelphia next. But still New York maintains an easy lead over all of them in import and export trade. All of these cities owe as much if not more of their present size to their industries than to their commerce. Baltimore is the least industrial of them.

Another interesting group to study includes Pittsburgh, Cleveland, Cincinnati, Toledo and Detroit. Cincinnati, the peer of them all in the days of the river traffic, is now losing its commercial

significance rapidly. Pittsburgh, Toledo and Detroit are predominantly industrial cities and have limited trade areas. Cleveland is the most important of the group both commercially and financially. Even Pittsburgh is becoming more tributary to Cleveland and less to New York and Philadelphia.

Within the area for which any one of the foregoing cities serves as import and export connection, or wholesaling or financial center, any number of cities of varying sizes may develop. Some of these may compete on vigorous terms with the larger cities roundabout for the jobbing trade of a large hinterland, as does Duluth with the Twin Cities, and Omaha with Chicago and St. Louis. Others, like Madison, Wisconsin, and Mankato, Minnesota, will compete for a much smaller hinterland. Each of these points is certain to be a small manufacturing center as well and to have its principal market or source of raw materials in its own hinterland. Financial dependence, like that of the whole country upon New York, is mostly determined by federal enactments making certain cities central reserve or Federal Reserve cities. But it is not altogether so determined, and banks in cities such as Omaha, or Sioux Falls, South Dakota, may carry accounts for smaller banks in their surrounding areas. Many of these smaller cities now have joint-stock banks, agricultural credit corporations and the like.

Still smaller than any of the foregoing cities are those which principally do the retailing for a small trade area. Usually such cities have plants such as creameries or canning factories for processing the raw materials produced in the area, and many have other industries in addition. Still smaller than these are the villages which are solely retailing, and may not even have a bank, although it is hard to find even a village that does not have a bank these days.

The Population Pattern.[1]—The foregoing presents what may be called the city or population pattern for a civilization such as found in a country like the United States. The pattern will not fit countries like India, having a largely handicraft and agricultural economy. It will fit only roughly the densely populated areas of Europe. The general scheme of this pattern is a few im-

[1] The author finds Professor R. M. Haig also using this expression in his recent article entitled, "Toward an Understanding of the Metropolis," *Quarterly Journal of Economics*, Feb., 1926.

portant port cities serving the interior, one of these being the financial center for the group, and in the hinterland of these ports a few large centers with special hinterlands within which they compete commercially and financially with the port cities, often with a high degree of success commercially, and within these smaller hinterlands still smaller cities also with special hinterlands within which they compete with larger cities roundabout as well as with the very large commercial cities. Upon this commercial pattern is imposed an industrial pattern based largely upon the location of supplies of raw materials and transportation facilities.

One must not get the impression from the foregoing that these cities can be put into definite ranks, New York first, then Chicago and St. Louis, then Omaha and Duluth, then Madison and Mankato, etc. The differences between cities in economic position and activities are almost altogether a matter of degree. Within the hinterland of any large city may be cities of all sizes and all degrees of competition with it, some so strong commercially that they are able to more than hold their own in much of the area, others so weak as to draw only a very little of the trade of a small area to them. These smaller centers may make large commercial and financial use of the larger cities near at hand, or may go around them to still larger centers. With these facts fully in mind, one can make good use of Professor Gras' concept of metropolitan economy, to which reference was made in Chapter IV. Professor Gras sets up the following criterion of a full-fledged metropolis: Most kinds of the products of the district concentrated in it for trade as well as for transit; these products paid for by wares that radiate from it; the necessary financial transactions involved in such exchange provided by it.[1] On this basis, he denominates the following eleven cities of the United States as metropolises: New York, Chicago, St. Louis, Philadelphia, Boston, Cleveland, the Twin Cities, Kansas City, San Francisco, Baltimore and Cincinnati.[2]

How Large May Cities Become.—There are no doubt positive checks operating all of the time to keep cities from becoming larger. If this were not the case, all the urban population of the United States would now be living in one city. The first of these are the ones, already presented, natural resources, transportation costs, processing costs, etc. As long as natural resources are

[1] *Introduction to Economic History*, p. 294. [2] *Ibid.*, p. 292.

scattered, urban population will be scattered so as to be near them. They can grow only as large as the natural resources will permit. If the natural resources are spread over a wide area, as are agricultural resources, then transportation will place a check upon growth. It will become cheaper to haul part of the products to another point and process them there. Carlot assembling and dispersing are also done most economically as near to the point of production and consumption as possible. Primary buying of produce therefore tends to move out to smaller points. The same is true of jobbing. As cities grow in size, the cost of living rises due to higher rents and higher internal transportation costs. This causes wages to rise. Rents for factory sites rise at the same time. Taxes rise because of the high costs of maintaining streets and other necessary public improvements. Under these circumstances, industries begin locating in the smaller cities roundabout—industry decentralizes.

Although these checks are constantly operating, the largest cities seem to be still growing rapidly. Between 1910 and 1920, the group of cities with populations over 100,000 gained 25 per cent, as compared with 23 per cent for the group with populations between 2500 and 25,000. It is probably significant that the group of cities with populations between 25,000 and 100,000 gained 33 per cent in population. The reason that the checks are not more effective as cities grow larger is probably that certain advantages of larger size are offsetting them. It must also be pointed out that cities are themselves circumventing many of the costs of too great concentration by improving their transportation, shifting their factories into the suburbs, and by developing secondary retailing centers at frequent intervals.

V. THE INTERNAL ORGANIZATION OF CITIES

It will be possible in this chapter only to mention a few of the problems involved in the internal organization of a city. This is a subject which is receiving much attention these days under the name of "city planning." The notion at the bottom of all discussion of city planning is that cities are not organized properly if left to develop by themselves without conscious direction. There seems to be evidence enough in almost any American city to substantiate such a belief. The city planners propose to determine in advance in what direction a city should grow, and what

streets will be necessary, and where the factories should be, and then make the city growth fit into such a scheme. Whether, however, any individual or committee on city planning can be wise enough, or certain enough of the future, to give better direction than none at all, is a question upon whose answer not all are agreed.

City planning takes two forms, one, *zoning*, and the other *street planning*. The zones proposed run about as follows: department stores, financial enterprises and offices, central markets and wholesale, retail and specialty stores, first-class apartment houses, heavy industries, light industries, first-class residences, second-class residences and apartment houses, etc. Street planning is interpreted broadly to include the layout of streets, water mains and sewers, and the size of lots and city blocks. Further aspects of city planning relate to laying out of parks and boulevards, planning of bridges, and building restrictions.

The most important single principle involved in city organization is the simple theorem of geometry that the center of a circle is nearer to all points of it than any other point within it. Consequently all enterprises would if they could be situated exactly at the center. Those enterprises win this position which can pay the most for the use of space. Office buildings represent a very intensive use of space because they can run to many stories without inconveniencing the occupants greatly, and because the business transacted in them needs little space for equipment and storage. It is also highly important that the professional men and business specialists who occupy them be readily accessible to each other and to their clientele both local and out-of-town. Department stores can pay high for space in spite of their high requirements for storage of goods because service and convenience to a large number of patrons is the principal basis for their existence, and because of the large number of customers whom they are able to serve in one day. Even then, they could not retain their downtown position if they could not build many stories high.

The wholesale district needs to be situated near railway terminals and wharves, and not too far from the general retail district. Such an area is generally available, but as cities grow it is generally far from adequate. Congestion of terminals and wholesale markets is therefore the usual condition of our large cities. Such enterprises cannot pay as high rents as downtown retail stores because of their high storage requirements. But they can generally pay

more than factories because of their more rapid turnover of goods. Factories must provide space for equipment as well as goods. The industries which remain downtown are those which need to be in the market, like the clothing industries, or those which furnish quick service to downtown people, such as the printing industries.

As cities grow, the " center " of the circle often shifts. Early in a city's history it is likely to be near the railway terminals and to move back from it slowly as the wholesale district expands. The growth of a city in its periphery may also shift the center. Most of the recent growth of Cleveland has been eastward, and the center of the city is slowly following it.

The actual organization of most cities conforms roughly to the pattern above outlined. But there are many misplacements. Some of these owe their origin to mistakes in original choices of location; more of them to failure of enterprises to shift with the growth of the city. Professor Haig in his recent study of the organization of New York City found two-thirds as much factory industry south of 59th Street in Manhattan as in the "twenty-mile industrial zone." But since 1917, all of the industries in this zone had declined in importance except printing. The number of factory workers employed in the lower zone declined 9 per cent between 1917 and 1922, and in the industrial zone increased 23 per cent.[1] There can be no doubt that much of this shift could well have occurred long before. Another mishap in city organization that frequently occurs is that factory districts start in several places, or apartment houses invade high-class residence districts.

The principle seems now to be generally accepted that individuals cannot be left free to operate any kind of a business where they will. As Professor Haig points out, the factory which is operating in an old downtown building may produce many times more loss from the congestion of traffic it causes than its rent amounts to. Building a garage on Euclid Avenue, Cleveland, may reduce residence value many times more than enough to pay the rent of the garage. But it is the public that suffers these losses, not the factory or garage operators. Under the circumstances, there is nothing for the public to do but make use of its municipal powers and protect itself.

Most streets in the United States are laid out upon the rectangular or gridiron plan. This is a convenient arrangement so

[1] *Op. cit.*, p. 409.

far as naming and locating streets is concerned, but it increases traveling distances greatly. Anyone wishing to go downtown in such a city, unless he happens to live on " main street," must travel two sides of a rectangle. The circular or concentric plan gives much shorter distances downtown, but makes many irregular blocks. The City of Washington is a compromise between these two plans, a gridiron with a concentric pattern imposed upon it with only a limited number of radial streets cut through. Something approaching this is accomplished merely by cutting a few main diagonal streets through a gridron pattern, as many large cities have been forced to do to relieve traffic congestion.

Planners of residence subdivisions now generally appreciate how much they can add to the residence desirability of building lots by laying out the streets according to the contour of the land and locating lots so as to take advantage of views.

Many cities are trying to solve their traffic problems by classifying their streets and setting certain ones aside for trucks and commercial traffic and others for automobiles. This, on the one hand, increases the number of vehicles that can travel on a given street, because all can travel at about the same rate of speed; but, on the other hand, it prevents the peak loads for the two kinds of traffic from dovetailing with each other.

Two different plans are being followed in the matter of parks, one to have a few large parks out toward the edge of the city, and the other to have a large number of small parks and playgrounds located conveniently with respect to the population. The ideal arrangement is to have some of both kinds.

VI. THE ECONOMIC FUNCTIONING OF A CITY AS A POLITICAL UNIT

The city operates as a political unit under a grant of powers from the state contained in a charter. The economic activities of cities in the United States are of the same general nature as those of the state and federal units, except that cities engage in more direct production and less regulation. The principal forms of direct production engaged in by cities, other than the specific functions of government itself, are education, street construction and maintenance, sewage and garbage disposal, street cleaning and street sprinkling, fire protection, police protection, water, lighting, gas, and street transportation. Relatively few cities own and operate street-car systems. Gas plants are more often privately

than publicly owned. Water systems are usually publicly owned. Cities have authority to regulate only trade that is within their borders and even that only to the extent of supplementing state regulation. Their regulation usually extends to trading in the public markets, weights and measures, the milk supply, and traffic. Further discussion of this subject will be reserved until after the function of the state in production has been discussed in the next chapter.

SUGGESTIONS FOR FURTHER READING

Adna F. Weber's *The Growth of Cities in the Nineteenth Century* (1899) contains much material of interest in connection with this chapter. See particularly Chapters III and IX. *The City* (1925) by Robert E. Park and E. W. Burgess discusses many of the important problems of city development. Chapter X has a very excellent bibliography upon urban communities. R. M. Haig's, "Toward an Understanding of the Metropolis," *Quarterly Journal of Economics*, February and May, 1926, pp. 179–208, pp. 402–434, is a recent contribution of interest. For a further discussion of metropolitan areas, see N. S. B. Gras' *Introduction to Economic History* (1922), Chapters V and VI, and Mildred L. Hartsough's *The Twin Cities as a Metropolitan Market* (1925). Discussions of city planning and zoning may be found in C. H. Cheyney's article Removing Social Barriers by Zoning, *Survey* (May, 1922), pp. 275–78, and in Nelson P. Lewis' *The Planning of the Modern City* (1916).

PROBLEMS

1. Give examples of cities that owe their origin to each of the causes listed in the text.
2. Outline briefly the market area of your home town and indicate to what extent this is determined by competition and by geographical influences.
3. Are there better opportunities for a young man in a town, small city or large city?
4. What size of city would you prefer to live in? Why?
5. Define a city.
6. How does the Census define a city?
7. Is it a sign of progress when young people leave the farms or is it a condition to be lamented?
8. Would many medium-sized cities rather than a few very large ones be socially desirable?
9. What social advantages has a city like Chicago or New York to offer, which smaller cities have not?
10. Will motor-bus transportation have any effect on the growth of different sized towns and cities?

11. The statement is often made that Iowa has few cities because of freight rates to Chicago. Is this an advantage or disadvantage to Iowa?
12. If the Great Lakes are opened to ocean vessels, will Duluth become the metropolitan center for the territory now included in the Twin Cities market area?
13. Can navigation on the upper Mississippi River be revived simply by deepening the channel?
14. Why is a city planning commission desirable? What activities or conditions are considered by such a commission?

CHAPTER XXXII

THE ECONOMY OF NATIONS

Political Economy, or the economy of the state, is a subject itself worthy of a whole introductory treatise. It would not be worth while even introducing it in the present treatise were it not that most of its economic principles are the same as those already presented. This chapter will erect upon these principles as a foundation the outlines of the structure of state economy.

Why Do We Have Nations?—Nations exist no doubt mostly for ethnological and historical reasons. If the peoples of the earth were less different in physical traits, there would be fewer nations. The histories of different peoples have given them different languages and literatures, and different customs, traditions, institutions and ideals. Conquest has imposed foreign institutions and languages upon races; but within a few centuries conquerors and conquered have usually become fused into one people. Modern peoples are therefore nearly all fusions of several race stocks. But nevertheless they all have their own languages and traditions.

But there are also economic reasons for having different nations. If we must have government, then it must be administered in territorial units. Even if the world were one great nation, we would still need territorial subdivisions of it for administrative purposes. For many reasons, it would be desirable to have these subdivisions laid out along economic lines, following economic groupings of various kinds. Fundamental geographical differences would determine the economic groupings. The existing division of territory between nations does not follow such lines in many cases; but nevertheless the objective is an important one. There is also a distinct economic gain from a reasonable amount of rivalry between territorial groups. The more unified and self-conscious the group, the more effective this rivalry will be. When the territorial group is a nation with its own physical traits and institutions, this condition is realized in high degree.

Economic Differences Between Nations.—The physical conditions in which the peoples of different countries find themselves,

coupled with the experiences through which they have passed, and the institutions and ideals which they have developed, have given to each of them its own set of economic conditions. It is one of the wonders of human existence that differences in economic conditions so vast as exist between nations at present can really be. Data already presented have shown a range in density of population from 2 in Australia to 649 in England and Wales, a range in the proportion of the population gainfully employed in agriculture from 7 per cent in England and Wales to 71 per cent in India, and a range in size of farms from 3 acres of agricultural land per person in Japan to 1571 in Argentina. Table LVII contains additional data of the same nature. The percentage of "agricultural" land ranges from 11 per cent in Sweden to 92 per cent in Belgium. Agricultural land is here defined as arable (or plow land) plus permanent pasture and meadow land. The percentage of agricultural land which is arable ranges from 2 per cent in Australia to 91 per cent in Japan and Denmark. The great live stock countries, like Australia, Argentina, Switzerland and Ireland, have a

TABLE LVII. A COMPARISON OF ECONOMIC CONDITIONS IN SEVERAL COUNTRIES [1]

	Population per square mile	*Per cent of land agricultural*	*Per cent of agricultural land arable*	*Agricultural workers per square mile agricultural land*	*Live stock per 100 agricultural workers*
Belgium	652	92	43	71	272
England and Wales	649	82	35	25	719
Japan	395	18	91	503	23
Italy	329	85	50	89	117
Germany	328	67	63	80	251
Switzerland	243	54	22	53	362
Denmark	197	67	91	44	760
France	184	64	64	62	228
India	177	37	90	159	179
Ireland	134	83	28	29	809
China	102	15	65	260	?
United States	35	37	47	11	878
Sweden	34	11	76	50	372
South Africa	15	75	3	6	677
Argentina	8	45	16	1	8,821
Australia	2	52	2	1	5,360

[1] Data are of the nearest census date in each country. From an unpublished study made by Carl R. Arnold under direction of the author.

large percentage of their land in permanent pasture and meadow. Denmark apparently has its pasture and meadow mostly in rotation with crops. The most startling contrast is in the number of agricultural workers per square mile of agricultural land, from less than 1 in Australia to 503 in Japan. The Japanese obviously do very little farm work with animals.

It is not difficult after studying this table to account for the differences in wages paid agricultural workers as indicated in Table LVIII. Wages of farm labor are over eleven times as high in South Africa as in China. Countries like South Africa and the United States are using farm labor not far from the point A of highest return per input of labor, and are using a large amount of the other elements of production with the labor so that the output per unit of labor would be relatively high almost anywhere upon the curve. In Japan and China, the combination of labor and land is well toward the point T of diminishing total returns to land, and besides labor has very little of other elements of production to work with it.

The foregoing comparison is made in terms of the agricultural population because comparable data of the sort needed are more available for the agricultural than for other population groups.

TABLE LVIII. WAGES OF FARM LABOR BY COUNTRIES[1] (PRE-WAR—AS NEAR 1913 AS POSSIBLE)

	Average farm wages per year with board	*Wages per year without board*
Japan	$26.07	
China		$42.00
Italy		100.00
Belgium (1910)		120.00
Germany	120.00	200.00
France (1915)		200.00
Switzerland		170.00
Denmark		185.00
Sweden		180.00
England and Wales (1910)	180.00	220.00
United States	256.00	364.00
Union of South Africa	300.00	480.00

[1] These wages have been reduced to dollars at par exchange rates. An effort was made to get representative figures for representative types of farm labor where data made this possible. From a study made by Carl R. Arnold under the direction of the author.

If they were available for other groups, they would show no great differences from the foregoing. The per capita returns in agriculture and in other fields of production are never far out of line in any country except for short periods such as since 1920. The rankings of the countries in per capita returns to agriculture and to other industries would run closely parallel.

The Point of View of the Nation.—The existence of such a wide range of economic differences between countries as evidenced by the foregoing at once calls forth the question as to what could have been the aims, or policies, or ideals, conscious or unconscious, of these different nations to have given them such vastly different economic conditions. It is possible for people to be just as prosperous in a relatively poor region as in a fertile one; but there will have to be fewer of them per square mile.[1] What is involved, therefore, is an adjustment between the population of a country and its natural resources, not only as to the amount of these resources, but also as to their utilization.

Following are a few of the points of view that various countries or peoples seem to have had:

1. *A large population as an end in itself.* This may be carried to the point of the lowest per capita return which will maintain life and permit reproduction to keep up the numbers. Religious teachings have fostered such a manner of life in many parts of the world. "Be fruitful and multiply" has its equivalent in many religious codes.

2. *A full utilization of the natural resources of a country.* New countries like the United States and Canada are certain to have a great ambition to get "settled up" as quickly as possible, to get their land into farms and improved, their water powers harnessed and their mines into production. There may be utilization which adds to the per capita income, and utilization which lowers it. If the new lands or mines which are brought into use are poorer than those already in use, as is generally the case, they will need to be handled upon a labor-extensive basis or the general level of well-being in the country will be reduced. There is also utilization which benefits the present at the expense of the future. Many old countries have their problems of utilization also. Strange as it may seem, some of the most hard-pressed peoples of the earth have not

[1] This would not be true if the region were so poor that it could not provide itself with roads, railways, telephones, schools, etc.

developed their mineral resources and water power resources to any great extent. The principal explanation of this is that they had increased their population to the point where saving and capital formation was nearly impossible long before the Industrial Revolution came, and they are not now able to accumulate the capital needed for developing the mineral and power resources which are the bases of modern industry.

3. *The highest possible well-being regardless of numbers of the population or utilization of resources.* This will require always stopping at the point A of highest per capita return measured in well-being. The proponents of such an ideal say that there is no use bringing any more souls into the world if it reduces the average well-being for all, that what we should desire is quality of population and a high order of comfort and satisfaction in life, and not quantity of numbers. Following this objective would stop all further development of the natural resources of a country, unless perchance it had not yet reached point A, or unless it could be done upon an extensive basis, or by means of machinery or other forms of capital goods, or by more improved methods. This statement assumes that the remaining resources of the country are all poorer than those now being used. This may not really be the case. Lack of capital for development, or the laggardness and lack of initiative of a people may have prevented developments that would raise the per capita output. Even in countries making rapid economic progress, opportunities are no doubt constantly present for profitable development of unappreciated resources.

A rise in the world level of real prices of the products of a nation may make it possible for that nation to develop its poorer resources farther without lowering the per capita income of its own people. This may happen because other nations are willing to increase their populations at the expense of their per capita incomes, or because these particular products are becoming relatively scarce. It is possible for relative scarcity and rising prices of one product or group of products to be offset by gains in efficiency of production in other lines. Thus prices of farm products might rise in the United States, and poorer and poorer lands be taken into use, either because populations were increasing faster than real incomes in the rest of the world, or because improvements in the arts in other fields were making a population increase possible without loss of per capita income, or for both of these reasons

combined. Within the United States alone, farm products might rise relatively in price, and poorer lands be taken into cultivation, with no loss in real incomes.

4. *Highest per capita income.* Distinction must be made between per capita income and per capita well-being. A country may divert its productive activity into lines that add nothing to the well-being of its population and reduce the numbers that can be maintained at point A. It may use large tracts of land capable of growing splendid crops for private hunting reserves; it may use vast acreages in growing barley, rye and corn for use in intoxicating beverages, or in growing tobacco and opium; or engage a large number of its people in providing cheap or even degrading entertainment; or it may even put so large a portion of leisure in its income quota as to reduce the per capita production of other things that may be more worth while. It may be argued that if these are real wants, they are entitled to as much consideration as are the wants for food or clothing or good books. If this argument is carried much farther, it becomes a complete justification for national and race and family suicide. It will exonerate all the profligate dynasties of world history. On the other hand, well-being cannot reasonably be interpreted to include only a bare margin over subsistence. We are here entering very far within the realm of opinion and personal philosophy, but most people will agree with the author that natural parks and playgrounds and golf courses may be more worth while for a nation than the additional population which the food they would grow would make possible. But even pleasure-seeking must have its limits; it may degenerate into selfishness of such a high order that the race does not reproduce itself properly. Surely the rearing of children and fitting them to be useful members of society is an objective for which a great deal of personal pleasure and comfort can well be sacrificed.

5. *Conservation of the nation's resources.* Although never a nation's sole objective, the preserving of the national estate for posterity weighs heavily in the balance in deciding the policies of many nations.

6. *A large nation.* This largeness may be envisioned in terms of territory, or population, or wealth. In the first form, it may lead to efforts to acquire new domains by conquest or purchase or "peaceful penetration." Many American statesmen have had

ambitions of this kind. President Roosevelt was a vigorous exponent of such a policy.

7. *A powerful nation*, especially in the military sense. This objective and the last may be completely identified with each other, or they may not. Size in terms of territory, resources, wealth or population means military strength. Some nations have built up their military strength as a basis for conquest. Many have desired to be powerful not with the idea of further territorial aggrandizement, but only to increase their feeling of security. Many nations in their time have no doubt been interested in mere numbers of the population because of the large armies that could be recruited. The production and consumption policies of a nation may be greatly affected by its military ambitions; likewise its external economic policies and trade relations with other nations. Economic and military conflicts are closely identified at times.

8. *Self-preservation.* This is the form that the military objective may take with a small nation.

9. *A great nation.* National greatness seems to be not greatly related in this modern era to size or strength in the military or economic sense. At any rate, it is posssible for achievement in the arts of peace to contribute as much to the glory of a nation as military success.

10. *Self-sufficiency.* The popular mind often conceives of economic independence as a great national ideal. The Commissioner of Agriculture in 1863 listed forty agricultural products, including tea, coffee, silk, sugar, rubber and hemp, which the United States was importing, and said that every one of them ought to be grown at home. As an objective, self-sufficiency is tied up with several others. Military preparedness may make it advisable for a nation to grow its own sugar and wool in peace time. Self-sufficiency and diversity may be looked upon as necessary to greatness.

National objectives as they actually occur are a mixture of the foregoing, with striking differences in emphasis. Few do not consider in some measure the per capita income or well-being. Few are not interested in numbers to some extent. Mostly all consider military preparedness and self-preservation with great care. Only a few of the elect are not unduly concerned over self-sufficiency.

What Shall a Nation Produce?—The only rational basis for a program of national production is the principle of comparative advantage. It is as wasteful of natural resources and of human

energy for a nation to be producing things for itself that it can buy more cheaply elsewhere, as it is for an individual to do it. In its application to national programs, however, the principle needs to be elaborated somewhat. To begin with, it must be understood as applying from a long-time point of view. A new country such as the United States is likely to have many undeveloped possibilities of production which need only a little assistance for a while in order to demonstrate that they have comparative advantage. Production of a new product in a new country or a factory is always at a disadvantage for a while. Producers hesitate to start under such conditions. This is even more true if the competition is with producers in another country. It may be very good national economy under such circumstances to subsidize the new enterprises. In popular discussion, industries thus subsidized have come to be called "infant industries." The United States has made the mistake many times in the past of selecting industries for subsidy which were unable to take care of themselves after they had been subsidized for a while. Tea growing was subsidized in the United States from 1859 to 1898, and silkworm culture nearly as long. Sugar beets are still vigorously subsidized. If the present enormous subsidies were removed from sugar beets and wool, the production of these would decline considerably.

If an industry is suffering from temporary reverses at home, or from temporary competition due to disarranged foreign markets, it is also good national policy to safeguard it. Following the World War was a period when many nations needed to adopt such policies.

Foreign countries also at times resort to unfair tactics in their trade with foreign countries. For instance, they may cut prices in a particular foreign territory and force its local industries out of business, reimbursing themselves for their temporary losses in contemporary gains in other territory. This practice is called "dumping." It is proper that nations should guard their industries against such practices.

The foregoing are all instances of interpretations of the principle of comparative advantage from a long-time point of view. The principle must also be interpreted from the point of view of interrelation between industries. A manufacturing industry may need certain chemicals available only in a foreign country, and even there under unsatisfactory conditions. Perhaps a rival

manufacturer in a foreign country controls the supply of it. It may be desirable under these circumstances to subsidize domestic production of these chemicals for a long period. Under certain circumstances it may be advisable to subsidize a type of crop or live stock production which will benefit the soil. The farmers should eventually come to see the value of the enterprise themselves, however, and carry it without the subsidy. The increasing amount of integration in industry increases the number of opportunities for such situations to develop, and also the time which is needed to give an industry a chance to demonstrate its ability to take care of itself. A large complex industry such as silk or cotton manufactures may need the subsidy for thirty years or more.

Now follow some circumstances in which it may be necessary to depart somewhat from a policy of allowing the principle of comparative advantage to operate fully. Some nations are so situated that practically all of their resources are of one type, agricultural, mineral or forest. Should such a nation remain agricultural only? or should it subsidize manufacturing so as to be a "well-balanced" nation? Imagine Iowa as a country by itself—should it be content to grow corn and hogs? or should it subsidize woolen, cotton and silk manufactures so as to have a textile industry? and leather and shoes, and hardware, and chemicals? The answer seems clearly in the negative. And yet if the people of Iowa were of one stock, speaking a language of their own, and having a literature and tradition of their own, what then? The tendency under such conditions is always to try to develop some measure of diversity. Some nations, like Denmark, adopt mild measures to bring this about; others, like Italy at present, adopt violent measures to accomplish it. But it must be admitted that there are no arguments in favor of diversity which justify most nations from departing far from a comparative advantage policy. The strongest argument for diversification is military preparedness. A nation all agricultural or all manufacturing is in a poor position to wage a war. The other argument is that it is more subject to economic reverses. It has all of its eggs in one basket. Denmark suffered severely for this reason during the latter part of the last century. Very many countries are partly in the condition just described. France would have deficits of several important commodities if it did not subsidize their pro-

duction. Italy, Germany, Sweden, Austria and Hungary would have deficits of still more. The military preparedness argument is no doubt valid for some of the European countries. But it has very little validity for the United States. If a case can be made for it at all, it will be with respect to a few chemicals, and wool. Everything else of importance, we either have at home, or have within easy reach. We could get our sugar from Cuba, Porto Rico and Hawaii. So far as the other arguments are concerned, they weigh very lightly in the balance against the great losses from trying to produce commodities at economic disadvantage.

For countries in the condition of the United States from 1820 to 1880, and perhaps Australia and Canada still, a special case can be made for temporary subsidies. These countries during these periods had rich and rapidly developing natural resources. Their production was largely extractive. The resources were available for a strong manufacturing industry, but not the capital and the experience. Subsidies to manufacturing industries at such a time give them a much needed start and put them in a condition presently to produce the capital they need. The United States has followed such a policy with striking effect; likewise the British colonies. Most economists agree that the United States would be more an agricultural and less a manufacturing nation than at present if this policy had not been followed. This, it will be apparent, is an " infant industry nation " argument for a subsidy. The difficulty with it in application is that when it comes time to remove the subsidy, the industries benefiting from it object. In the United States, the industries so subsidized were so numerous, and have been allowed to grow so powerful, that many have despaired of ever being able to remove the subsidies. Surely the subsidies should be removed only slowly. There will be some plants in many of the industries that need the subsidies in order to continue in operation. To remove the subsidies all at once would demoralize industry. Time is needed to develop new enterprises to take the place of those closed out. Once the subsidies were removed, there would be fewer plants in the lines of production where our comparative advantage is slight, and more in the lines where our advantage is large.

Immigration.—If in country A the ratio of labor to the other elements of production is such as to give a per capita product of 10, and in country B a product of 6, and 10 per cent of the popula-

tion of B were to emigrate to A, then the per capita products would become much more nearly alike. No people anywhere beyond point A in the ratio of labor to resources would, in their right mind, allow foreign people to come and divide resources with them—unless the arrangement was a reciprocal one. And in that case they would want to observe carefully how the reciprocal arrangement was working and whether or not more were coming in than were going out. While the United States had vast undeveloped resources fully as rich as those already developed, it could for the time being look with equanimity upon the rapid influx of foreigners. It can do so no more. Unless some remarkable developments take place in the arts, having the effect of bringing production back to point A again, if we allow an excess of immigration over emigration, we must do it with an understanding that it is largely an act of charity. Moreover, it is a foolish form of charity, for the populations of the countries from which the immigrants come at once fill up the gaps by reproduction, and the home folks are no better off than before. Meanwhile the world is acquiring a larger percentage of Italians, Greeks and Russians, and a smaller percentage of the people of better living standards. The only benefit which we as a nation are getting from this process is the benefit of admixtures of cultures and traditions; and this is a doubtful benefit much of the time.

The Support of State Activity.—Before taking up the rôle of the state in the productive economy of society, we must consider for a moment the manner of its financing. Public production roughly falls into two groups: that which is supported out of its own receipts, like the public utilities, and that which is supported by taxation. The former are usually financed by borrowing money by the sale of bonds, which are retired out of the earnings of the public enterprises. Current expenses are met out of current receipts. There are a few special forms of taxations which need to be distinguished from the rest, namely, fines, fees and special assessments. Fees are paid for particular benefits or privileges conferred and are roughly in proportion to the cost of the service. Special assessments are paid for particular improvements made upon property and are intended to be strictly according to the cost of making them. The remaining forms of taxes are levied upon various bases, assembled in the public treasury, and allocated to various uses without regard to the basis of their collection. It

thus appears that activities supported by fees and special assessments are in a sense intermediate between the public utility type of activity and the strictly tax-supported type. Distinction is commonly made between direct and indirect taxes. Direct taxes are those which we pay ourselves directly into the public treasury; indirect taxes are those which we pay for in the form of higher prices for taxed commodities and services. The price which we pay for a pound of sugar includes nearly two cents of indirect taxes.

Taxes are in effect money taken out of private accounts and transferred to public uses. The principle is sometimes affirmed that no money should be taken from individuals and used for public purposes unless the individual himself would find it in his own interest to make the same use of it. Such a principle needs one important qualification, namely, that the majority rules in all such decisions. It is impossible to spend money for any public purpose without spending money of some individuals that they could use to better advantage for other purposes. Hence a rule of action such as the above if strictly followed would prohibit all public activity whatever. Consequently individuals frequently find themselves contributing to the support of public activities from which they derive no particular benefit. Persons without property may pay for fire protection; well-to-do persons without children may pay heavily for the support of public education. The principle also needs another important interpretation, namely, that it cannot be left to the individual to decide whether any form of public activity is worth receiving his support. The point of view of the state is broader and covers a longer period of time than that of most individuals. Although an individual may have no property, losses from fire enter into the cost of everything which he buys, and he is nearly as much interested in fire protection as the man with property; but rarely does such an individual realize this fully. Education must be a continuous enterprise, one generation building upon another. It is fundamental to the future of any nation and society. A wealthy individual who is interested in his country must also be vitally interested in the education of other people's children. He is more interested in education for the poorer classes than for his own kind because they need it more.

Three bases of levying taxes are commonly described, namely, *benefits received*, *ability to pay*, and *convenience or ease in collecting*.

If taxes can be levied on the basis of benefits received, they meet with much less resistance than otherwise, and it is therefore desirable to use benefits as a basis as far as possible. Supporting public roads out of gasoline taxes is a recent example of such taxation. But it is impossible to use this as a sole basis. It is impossible to determine benefits in the first place; and in the second place, many receive benefits out of all proportion to their ability to pay, which benefits, however, the state is anxious that they shall receive.

Taxation according to ability to pay is taxation according to income. One justification of this is equality of sacrifice—paying a thousand dollars in taxes is no more of a sacrifice for a rich man than paying a dollar is for a poor man. Another justification is that having a large income is proof of benefits received in the past. While the well-to-do individual is usually in considerable part responsible for having accumulated his wealth, he also owes a great deal of it to the social arrangements that have been provided that have made it possible. The free exploiting of our natural resources that the governments have permitted have enabled many men to amass fortunes. The corporation, wholly a creation of the state, has provided the basis for great accumulation of wealth. Tariffs, another great source of fortunes, are entirely a governmental device. Even in a country as young as the United States, probably as large a part of the wealth of the present generation has been inherited as has been earned by it. Inheritance is another wholly social arrangement, capable of being removed root and all from our social fabric if it were needed. A very large part of the activity of government relates to property itself, protecting titles to it, enforcing contracts with respect to it, and protecting it from fire and theft. We need only to think of the insecurity of property in disorderly nations like Mexico or Turkey in order to realize this. The military item is by far the largest expense item in the national budget. Wars are fought as much if not more to protect property than to protect persons.

The other justification for taxation according to ability to pay is the convenience or ease of collecting public income on this basis. As a matter of fact, modern governments cannot get the income which they need without doing great injury to future generations unless they take a large part of it from those who can easily afford to pay large amounts in taxation. Convenience is also the excuse

for most indirect taxation. Governments could not usually get all the income which they need if they sought it directly. Indirect taxes are concealed taxes. If the consumers of the United States were to receive a slip with every purchase of goods showing how much the price had been raised by tariffs, they would soon vote to have them reduced.

The Sphere of State Activity.—Professor John R. Commons of the University of Wisconsin describes three points of view with respect to the rôle of the state in human affairs. He calls these three points of view *the socialistic*, *the anarchistic*, and *the syndicalistic*. The socialist says, "Let the *state* do it;" the anarchist, "Let the *individual* do it;" and the syndicalist, "Let the *association* do it." The socialist is in favor of expanding the sphere of public activity, particularly in the matter of public ownership and operation of industries. The anarchist is in favor of as few restrictions as possible upon individual freedom of action. The extreme anarchist would abolish all laws and all governments and all enforcement of contracts. The syndicalist favors having an increasing amount of production and of control of society left to associations of individuals. The strong labor union man, and the strong coöperation man, belong to this group of thinkers. The extreme syndicalists favor even abolition of governments and leaving all control with the associations.

The issue here involved is a very old one. Plato discussed it in his *Republic*. In the mercantilist period in European history, the power of the state was expanded. While mercantilism and socialism have much in common, they are far from identical. The mercantilist favors state regulation rather than state ownership. Adam Smith and his followers advocated less state activity. They believed that if in general each individual was left to himself to seek his own best interests, the best utilization of resources would result; and that private enterprises are better managed than public enterprises. This was the reigning philosophy until past the middle of the last century, when a strong reversal set in, which still continues. The strongest dissenting voice was that of the state socialists, who advocated public ownership of the instruments of production, particularly of buildings and equipment. The labor union movement brought to the fore the syndicalist point of view. The labor unions were organized to defend the workers against the extremes which resulted from the unregulated

self-seeking of the entrepreneurs of the last century; but they have consistently opposed any great governmental interference with their prerogatives, as illustrated by their recent opposition to the Kansas "industrial court." Only last winter, the coöperatives of the United States took a violent stand against the passage of an act providing for a larger measure of federal supervision of their activities.

John Stuart Mill in his *Principles of Political Economy*, published in 1848, just at the turning point from extreme *laissez faire* policies, summed up the case against government interference as follows:[1]

1. There is a large sphere of rights which are sacred to the individual and should not be invaded by government unless highly necessary. The burden of proof is always upon government in such matters.
2. Governments at the best are ruled only by majorities. Even though the right is one that is properly invaded, the interests of the minority are entitled to consideration.
3. Government action checks coöperative activity. It is always best to have people to do things for themselves if they will.
4. Governments generally do things less well than private individuals because employees of government seldom have as much at stake as they would have if they were working for themselves.
5. Government activity takes funds from industry. For the most part, it is only a necessary evil.

But even Mill listed several forms of public activity as "necessary" or desirable or "optional," among which were the following:

1. Protection of people against force.
2. Protection of consumers against fraud and adulteration of goods.
3. Carrying out of judgments of the community against the "twentieth man."
4. Enforcement of contracts.
5. Settlement of disputes.
6. Regulation of inheritances.
7. Care of dependents.
8. Protection of children.
9. Education.

[1] Book V, Relation of the State to Industry.

Mill considered the last two or three of the foregoing as distinctly optional; and some of his contemporaries would have thus classified several more of them.

As examples of activities in which governments should definitely not engage, Mill mentioned granting tariff subsidies to industries, granting government monopolies, price fixing, restricting interest rates, restricting freedom of speech and of the press, and restraining combinations of workmen.

It is now generally recognized that there is more fundamental conflict between the individual and the national points of view than Mill believed, and certainly more than Adam Smith believed. One important phase of this conflict is illustrated by the conservation problem. The point of view of the state is so much longer and broader than that of the individual that there is almost bound to be a difference in interests. As long as virgin timber is available in abundance, the lumberman makes his greatest profits by slashing out the big trees as cheaply as possible and moving on to new areas. The new crop, or even the second cutting, is too far in the future for him to wait for it. The national interest would prescribe selective cutting, burning of brush, and leaving an occasional large tree to provide natural reseeding.

Immigration policy illustrates this fundamental conflict fully as well as does conservation. Most employers of labor favor immigration because it causes low wages and increases their profits. If immigrant labor can be hired for less than it contributes to the product, there is a clear gain to those employing it. The nation taken as a whole may even profit from it so far as the present is concerned, although it is always probable that the per capita product will be reduced more by the increase in number of laborers than the margins of profit on the under-paid foreign labor will offset. Any way it works out, the native-born laborers will lose by it because they will have both their wage and their per capita product reduced. Granting that the net national dividend to the native-born is increased by it, it can be only for a short time. In the next generation if not sooner, the immigrant element will be sharing in the social dividend on the same basis as the native-born; the natural resources of the country will have been divided with them. In this case, the interest of the nation is in accord with the interest of one class, but not of another.

Subsidies to infant industries always benefit the small group

engaging in them at the expense of the rest. But it is hoped that in the end the rest will benefit also and recoup their temporary losses.

A system of wholesale tariff subsidy such as is fastened upon the United States is constantly benefiting a large number of groups at the expense of the rest, and to the detriment of the nation as a whole. The group receiving subsidies are so numerous and represent so many people that they probably constitute a majority of the nation. Yet only a few groups are probably receiving enough subsidy to repay them for their share of the loss of total national dividend which results from producing so many things at comparative disadvantage. There is not so much real conflict of interests here as failure to understand real interests. The increases in price of particular commodities due to tariffs are much more apparent than the general losses from a tariff system. Prices are believed to have been increased in many cases where such is not the case.

Mill recognized the need of protecting the public against adulteration of foods and clothing; but he did not recognize the extent of this need. We are spending a much larger part of our income for manufactured goods to-day than in Mill's time.

Mill did not realize the large number of lines of production that are "affected with a public interest." The concept of "public" and "quasi-public" has mostly developed in the past seventy-five years. Mail systems were an early example of a public utility. The nation early recognized the great advantage to commerce and industry of a quick and regular mail service. Our early statesmen saw the importance of providing mail service to the settlers on the uttermost frontier. Even to-day, mail service is provided for many regions that a private mail service could not profitably serve. Another special circumstance involved in the case of all public utilities is that the people served by them have not the usual protection which competition gives against unreasonable rates. It is not feasible to have several street-car lines on one street, or several railroads serving every city and village, or several telephone systems in one community, or several water, gas or lighting systems in one city. If only one can operate, then it has a monopoly of the situation, and its rates and service must be publicly regulated. Railway service is now looked upon as almost in the same class as mail service. In many countries, railroads are

publicly owned and operated and the passenger and freight rate schedules are adjusted in considerable part to the needs of the country just as are our mail rates. The United States government found it necessary to operate railroads during the period of participation in the World War, and may eventually find it advisable as a permanent policy. For the present, government participation in the railway business is restricted to vigorous regulation of rates and service, a certain measure of control of wages and working conditions, authorization of issuances of stock and sale of railway securities, and limitation of dividends upon stock. There has been much discussion as to whether telephone and telegraph systems should not be publicly owned and operated. The private owners of these systems in the United States have in considerable part obviated the need for this by their consolidation and close co-operation with each other. Water systems and gas and light systems are either publicly owned and operated or else subjected to a high degree of rate and service control. One of the reasons that street-car systems charge the same rate for long rides as for short rides is that cheap rates to the outskirts of the city reduce downtown congestion of population. Reasons of this kind have prompted some in recent years to argue that street-car service should be supported entirely or in part out of public funds.

Wherever wasteful duplication of service develops under a system of competition between private agencies, there is certain to be a tendency toward public ownership. This is well illustrated by our railway system with its large number of competing and more or less parallel lines. A more interesting case is that of milk distribution, now a public enterprise in a few places. The total distance traveled each day by all competing milk wagons in many cities is several times the length of the streets. Problems of this kind, however, frequently solve themselves. One of the milk distributors may have an advantage over its competitors and gradually acquire most of the business, or the territory may come to be divided roughly between a few large distributors, one supplying the high-class residence districts, another the workingmen's districts, etc. This consolidation and unification of service has made great headway in the telephone, telegraph and express service of the United States.

An important distinction is made these days between three types of public activity, *extension*, *service* and *regulatory*. Exten-

sion work is merely extramural education. It may be organized into classes, as in night schools and institutions, or may be individual. Extension work has for its aim the teaching of people how to do things; service work, actually doing it for them. Collecting and disseminating current market news is a form of service-work; also installing auditing and accounting systems, or conducting research. In addition to the types of regulation already mentioned should be named among others the establishing and enforcing of market grades, or rules of quarantine against diseases, rules against misbranding of goods, traffic ordinances, and standard weights and measures. The list is a long one, and includes many things that would not have occurred to Mill. Society has become much more complex than could possibly have been foreseen seventy-five years ago.

Service work is supported both publicly and coöperatively. The justification for public support of it is that it either requires joint effort, or is more economically done on a joint basis. Public enterprise has made great headway in research because small entrepreneurs cannot singly afford to maintain laboratories and experiment stations. The method of trial and error is costly. A public research agency can conduct an experiment, and the results will serve them all. A further reason for making research a public function is that the information needed must often be collected from a large number of individual enterprises. An impartial third party is more likely to be intrusted with such information than a competitor.

There is no reason, however, why research cannot be supported coöperatively as well as publicly. Many agricultural experiment stations are thus supported in Europe. In the United States, many organizations of small-scale entrepreneurs are supporting or assisting research bureaus for carrying on such investigations. The large coöperative marketing organizations are giving more and more attention to research.

Extramural or extension education is largely a development of the past fifty years. It made its beginning in the field of agriculture and was then entirely publicly supported. Within the past eight years, it has come to be supported in part by membership fees in county associations, usually known as "County Farm Bureaus." In the merchandising field, many of the associations of retailers now have paid secretaries and assistants who devote

their time in part to what may be called extension education. The large coöperative marketing organizations have field service departments for this purpose. No doubt more and more extension work will be supported coöperatively as time goes on. There is a disposition for the public to feel that both research and extension work is service in the interest of special groups or classes and should be supported by them.

Organizing research and extension work as a public and coöperative enterprise also represents in part a way of securing the economies of large-scale production. Only by combining the research and extension needed by a large number of small units can enough of it be obtained to permit economical operation, and to engage the grade of skill needed for such work. This, however, is a less important aspect of it than the duplication of effort which is saved.

The most important justification for the regulatory activity was expressed in Mill's dictum concerning the need for carrying out the judgments of the community against "the twentieth man." If even one man in every twenty insisted upon driving on the left upon the highway, traffic would be greatly impeded; if one man in twenty were to sell 55 pounds of potatoes to the bushel in place of 60, all trading in potatoes would be greatly encumbered and confused. The force of law is needed in such affairs. They must therefore be administered by governments. We would probably not limit interference to-day to cases where only one man in twenty is involved. We would say instead that in any case where uniformity of practice was important, even though fifteen in twenty had to change their ways, regulation was justified; likewise in cases where a large proportion of the persons involved were engaged in practices which were detrimental to the general welfare.

No single question has caused so much debate in Congress and our state legislatures and in city and village councils as the question as to how far it is proper to go in imposing public regulation upon individuals and in interfering with free competition. The most anarchistic group in the United States are the entrepreneurs, particularly those conducting large enterprises. This group has been particularly outspoken since 1920 in its denunciation of public regulation. The Republican party at present is strongly inclined toward non-interference. In the Roosevelt and Wilson period, the trend was in the opposite direction. The platform of the "Bull Moose" party was an outspoken declaration of faith

in the efficiency of further restrictions upon private enterprise. But although business men generally oppose governmental interference with their affairs, they do not object in the least when it benefits them greatly. The most pronounced form of interference with private industry that exists in the United States is the protective tariff system, which a large proportion of the business interests of the nation ardently espouse.

This leads to the general statement that few persons can be definitely classified as anarchistic or socialistic or syndicalistic. Each is a combination of all three points of view. The most socially minded persons resent what they consider undue interference with their private affairs; the most individualistic want regulation for the other fellow when the other fellow's activities encroach upon theirs; and all want the activities of associations to which they belong to be as little curbed as possible. It is plain that under such circumstances, there is no escaping a constant clash of interests between individuals and groups.

It seems equally obvious that a society such as ours will never be wholly anarchistic, or wholly socialistic, or wholly syndicalistic. The prospects are for an increasing measure of control by governments, and an increasing volume of public activity; and at the same time for an increasing volume of association or coöperative activity; and necessarily at the same time for an increasing encroachment upon individual freedom of action. The concept of liberty is steadily including more and more of the idea of participation of free government, and less and less of the idea of freedom to do as one pleases.

Another fruitful cause of discussion is the extent to which governments can be effective in correcting social evils. Many incline toward a belief that economic laws have to work themselves out, and that there is little that legislation and governmental administration can do to change the outcome. At the other extreme are those who rush to Congress and state legislatures for relief from every real or fancied economic ill. These two attitudes have been abundantly manifested in the efforts at remedial legislation during the past five years. As is nearly always true, the truth is not far from halfway between these two extremes. Some legislative measures work. Tariff subsidies are an example of this. They produce some of their good and bad effects very shortly, and some of them only after a decade or two. Whether other forms of arti-

ficial price-fixing will work is another question. Subsidies to public roads surely produce the desired effects, some at once, others only slowly. Public education produces its effects rather slowly; likewise extension and research. Regulation, such as that of the railroads, is generally effective; but it usually entails some accompanying effects other than those desired. The undesired effects may more than offset the good effects intended.

The Nations of the Future.—It can only be earnestly hoped that the nations of the future will come increasingly to set up the per capita well-being of their people as their objective, and that in order to accomplish this they will increasingly take advantage of the benefits of a free exchange of goods. Crass, almost jingoistic, nationalism is altogether too prevalent in the world to-day for the good of mankind. The nation is set up in too many people's minds as an end in itself. Nations exist for the good of mankind; not men for the preservation of the nation. The recent spectacle of half the world sacrificing a good portion of the economic achievement of half a century for the sake of furthering national aspirations, is sufficient evidence of the false ideals that have too generally been inculcated.

SUGGESTIONS FOR FURTHER READING

Additional readings that will prove suggestive in connection with the subject matter of this chapter are Allyn A. Young's Economics and War, *American Economic Review*, March, 1926, pp. 1–13; L. C. Gray's *Introduction to Agricultural Economics* (1924), Chapter XIII, and H. C. Taylor's, *Outlines of Agricultural Economics* (1925), Chapter VII.

For a discussion of the sphere of government activity and problems connected therewith, see John Stuart Mill's *Principles of Political Economy* (1848), Book V; Adam Smith's *Wealth of Nations* (1776), Books III, IV and V, and F. W. Taussig's *Principles of Economics* (1921), Chapters 64, 65 and Book VIII.

Edward Wiest's *Agricultural Organization in the United States* (1923), Chapter I, discusses the question of public versus private organization in agriculture.

PROBLEMS

1. Give three factors which tend to strengthen national feeling. Give three which show a weakening of national feeling.
2. Will there be as much friction between classes in a nation having a diversified industry as in one which is highly specialized in a single line of production? Why?

3. What, in your opinion, should be the ultimate aim of a nation?
4. Is competition as keen between nations as between individuals within a nation?
5. Where would the greatest saving be made, by reducing the wastes of national competition, or by reducing the waste of individual competition?
6. Rubber can be grown in the Philippine Islands. The United States has pledged independence to the Philippines when they become able to govern themselves. Many now believe we should retain possession of the islands permanently so as to insure ourselves a supply of rubber. Comment upon the economic problem involved.
7. In case the United States' imports should be largely cut off by an enemy blockade, the supply of what important commodities would be most seriously affected?
8. Is this sufficient reason to plan on becoming as completely self-sufficient as possible?
9. Has the restricted immigration policy had an appreciable effect upon wages?
10. Are you in favor of an increased or decreased restriction of immigration? Why?
11. Which method of taxation do you believe the best, according to ability to pay or according to benefit received?
12. Does "benefit received" correspond to "ability to pay" in all cases? In any case?
13. "An indirect tax is an easy tax to collect; therefore it is a good method of taxation." Comment.
14. Why cannot the individual be allowed to decide whether he will educate his children?
15. Name two activities which we now believe to be best carried on by the state, by the individual, by an association.
16. Do you look for an extension or restriction of government activities? Why?
17. If nations come to adopt the greater per capita well-being as their objective, will intense nationalistic feeling become of more or less importance?

INDEX

4^{50}